Subject Categories of the Division H. Physics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

Subject Categories of the Division I. Social Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

80 Social Sciences (General) 235

Includes educational matters.

81 Administration and Management N.A.

Includes management planning and research.

82 Documentation and Information Science 236

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see *61 Computer Programming and Software*.

83 Economics and Cost Analysis N.A.

Includes cost effectiveness studies.

84 Law, Political Science and Space Policy N.A.

Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

85 Urban Technology and Transportation N.A.

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation. For related information see *03 Air Transportation and Safety, 16 Space Transportation*, and *44 Energy Production and Conversion.*

Subject Categories of the Division J. Space Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

Subject Categories of the Division K. General

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

99 General 247

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

tonsorial relations to study crack propagation-embrittlement problems at the level of details of bonding orbitals. Next Molecular Dynamics will be performed to show effects of temperature on this micromechanical dynamics.
DTIC
Monte Carlo Method; Hamiltonian Functions; Quantum Optics; Crack Propagation; Micromechanics; Stochastic Processes; Crystallinity; Thin Films; Surface Roughness; Ferromagnetism

67
THEORETICAL MATHEMATICS

Includes topology and number theory.

19970020441 Rutherford Appleton Lab., Chilton, UK
A Complete Leading-Order, Renormalization-Scheme-Consistent Calculation of Small-x Structure Functions, Including Leading-ln(1/x) Terms
Thorne, Robert S., Rutherford Appleton Lab., UK; Jan. 1997; ISSN 1358-6254; 115p; In English
Report No.(s): RAL-TR-96-065; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11 0QX, UK), Hardcopy, microfiche

We present calculations of the structure functions F(sup 2)(x,Q(sup 2)) and F(sub L)(x,Q(sup 2)), concentrating on small x. After discussing the standard expansion of the structure functions in powers of alpha (sub 3)(Q(sup 2)) we consider a leading-order expansion in ln(l/x) and finally an expansion which is leading order in both ln(1/x) and alpha(sup 3)(Q(sup 2)), and which we argue is the only really correct expansion scheme. Ordering the calculation in a renormalization-scheme-consistent manner, there is no factorization scheme dependence, as there should not be in calculations of physical quantities. The calculational method naturally leads to the 'physical anomalous dimensions' of Catani, but imposes stronger constraints than just the use of these effective anomalous dimensions.
Author (revised)
Factorization; Computation; Functions (Mathematics)

70
PHYSICS (GENERAL)

For precision time and time interval (PTTI) see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

19970019389 Massachusetts Inst. of Tech., Cambridge, MA USA
Applications of the Theory of Distributed and Real Time Systems to the Development of Large Scale Timing Based Systems ***Quarterly Report, 1 Jul. - 30 Sep. 1996***
Lynch, Nancy A., Massachusetts Inst. of Tech., USA; Sep. 1996; 8p; In English
Contract(s)/Grant(s): F19628-95-C-0118
Report No.(s): AD-A317470; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), microfiche

Members of MIT's Theory of Distributed Systems group continued their work on modelling, designing, verifying and analyzing distributed and real time systems. The focus is on the study of "building blocks" for the construction of reliable and efficient systems. These works fall into three general categories: modelling and verification tools, algorithms and impossibility results, and applications.
DTIC
Real Time Operation; Distributed Processing; Algorithms

19970019721 Virginia Polytechnic Inst. and State Univ., Electro Magnetic Interactions Lab., Blacksburg, VA USA
Rough Surface Scattering Studies Using the Method of Smoothing ***Final Report, 1 Apr. 1992 - 31 May 1996***
Kapp, David A., Virginia Polytechnic Inst. and State Univ., USA; Brown, Gary S., Virginia Polytechnic Inst. and State Univ., USA; May 31, 1996; 5p; In English
Contract(s)/Grant(s): DAAL03-92-G-0099
Report No.(s): AD-A316815; ARO-29633.1-GS; No Copyright; Avail: CASI; A01, Hardcopy; A01, microfiche

This report summarizes findings relative to the suitability of the Method of Smoothing to the prediction of scattering from randomly rough surfaces. It also outlines the method called the Method of Ordered Multiple Interaction (MOMI) for reducing storage and running time requirements.
DTIC
Electromagnetic Scattering; Surface Roughness

19970019734 Naval Research Lab., Acoustics Systems Branch, Washington, DC USA
Systematic Splitting of Wavefields into Unidirectional Modes: Long-Range Asymptotic Methods for Weakly Uniform Media
Gragg, Robert F., Naval Research Lab., USA; Aug. 08, 1996; 45p; In English
Report No.(s): AD-A317497; NRL/FR/7144--96-9799; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche
A series of pseudo-unitary transforms is devised and applied to the Helmholtz equation for a weakly nonuniform one-dimensional medium, decoupling the wave field in a consistent order-by-order way into counter-propagating modes. The result is a generalized form of d'Alembert decomposition, providing an asymptotic solution without backscatter at arbitrary order. Low-order contributions correspond to the standard WKB approximation. Higher orders provide additional terms of potential importance in applications involving propagation over long ranges, e.g., long time-of-flight measurement and very-long-baseline interferometry. Evidence is presented that this decoupling scheme is equivalent to high-order Born approximations.
DTIC
Wave Propagation; Wave Equations; Asymptotic Methods

19970019756 Calspan Corp., Buffalo, NY USA
Plasma and Flowfield Induced Effects on Re-Entry Vehicles for L-Band at Near-Broadside Aspect Angles, Volume 1, Experimental Measurements Program Summary and Aerothermal Data Analysis ***Final Report, Jan. 1994 - Sep. 1996***
Chadwick, Kenneth M., Calspan Corp., USA; Boyer, Donald W., Calspan Corp., USA; Andre, Stephen N., Calspan Corp., USA; Sep. 1996; 122p; In English
Contract(s)/Grant(s): F19628-94-C-0015; AF Proj. 4087
Report No.(s): AD-A317594; PL-TR-96-2094-Vol-1; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche
A laboratory measurements program has been performed in the Calspan 96 inch hypersonic shock tunnel which has provided a data base on the effects of the ionized flow field about a reentry vehicle on RF energy propagation. The measurements, performed under laminar flow conditions, provide data on plasma induced phase shift and attenuation of incident (uplink) RF signals for three aspect angles around broadside of the test vehicle, as well as measurements of reflection coefficient of an open ended waveguide antenna and mutual coupling between antennas on the vehicle. Vehicle orientations included combinations of pitch and yaw so as to include the effects of crossflow on the measurements The experiments were performed at an L band frequency, under free-stream test conditions of 14,000 ft/sec at an equivalent density altitude of 140 kft. Surface distributions of pressure and heat transfer were measured, as well as profiles of the electron number density through the ionized flow field by means of thin-wire electrostatic probes.
DTIC
Plasmas (Physics); Radio Frequencies; Hypersonic Shock; Antenna Couplers

19970020206 Minnesota Univ., Dept. of Electrical Engineering, Minneapolis, MN USA
Strain-Induced Polarization Effects for III-V Heterostructure Device Applications ***Final Report, 1 Apr. 1992 - 30 Jun. 1996***
Ruden, P. P., Minnesota Univ., USA; Nathan, Marshal I., Minnesota Univ., USA; Aug. 28, 1996; 8p; In English
Contract(s)/Grant(s): DAAL03-92-G-0043
Report No.(s): AD-A317004; ARO-29616.1-EL; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche
The effects of externally applied uniaxial stresses on III-V double barrier resonant tunneling devices was studied experimentally and theoretically. Devices were fabricated on (001)- and (111)- oriented substrates and subjected to stresses in the plane and perpendicular to the plane of the wafer. The current vs. voltage characteristics of these devices were calculated in the framework of a model that takes into account stress effects on the bandstructure as well as piezoelectric effects. Good qualitative agreement between the experimental and theoretical results was achieved.
DTIC
Heterojunction Devices; Fabrication; Piezoelectricity; Stresses; Strain Rate; Resonant Tunneling; Band Structure of Solids

19970020308 California Univ., Irvine, CA USA

Workshop on Rough Surface Scattering and Related Phenomena ***Final Report, 1 Mar. 1996 - 28 Feb. 1997***

Maradudin, Alexei A., California Univ., USA; Sep. 1996; 151p; In English, 23-28 Jun. 1996, Yountville, CA, USA

Contract(s)/Grant(s): DAAH04-96-1-0039

Report No.(s): AD-A316745; ARO-35186.1-PH-CF; No Copyright; Avail: CASI; A08, Hardcopy; A02, microfiche

This proposal for 15k is to support conference expenses (ground transportation, lodging and select meals) for participants attending 'Workshop on Rough Surface Scattering and Related Phenomena,' to be held in Napa Valley, California, June 24-27, 1996. It is intended that there be no more than about 25 participants. The topics to be covered in this workshop fall into three categories. The first is the direct scattering problem: given a rough surface, what is the scattered field? The surface in question can bound a homogeneous medium or, more interestingly, an inhomogeneous medium. Reports on new physical phenomena in scattering from such surfaces, as well as methodological advances in calculations of this scattering, will be sought. The second category is the inverse scattering problem: given some kind of (specified) scattering data, can one reconstruct the surface from which the scattering occurred, or can one extract information about the statistical properties of the surface (e.g. the power spectrum of a randomly rough surface)? Again, reports on methodological advances will be sought. The third topic is near-field optical microscopy, with an emphasis on the possibilities of resolving surface structures, topographical and/or optical, with dimensions much smaller than the wavelength of the incident light.

DTIC

Electromagnetic Scattering; Surface Roughness; Inverse Scattering; Conferences; Statistical Analysis

19970020319 Lecce Univ., Italy

Proceedings of the First Workshop on Nonlinear Physics Theory and Experiment. Nature, Structure and Properties of Nonlinear Phenomena

Alfinito, Eleonora, Editor, Lecce Univ., Italy; Boiti, Marco, Editor, Lecce Univ., Italy; Martina, Luigi, Editor, Lecce Univ., Italy; Pempinelli, Flora, Editor, Lecce Univ., Italy; Jul. 1996; 622p; In English, 29 Jun. - 7 Jul. 1995, Lecce, Italy

Report No.(s): AD-A317697; CSP-95-1028; No Copyright; Avail: CASI; A99, Hardcopy; A06, microfiche

This volume constitutes the proceedings of the Workshop Nonlinear Physics. Theory and Experiment held in Gallipoli (Lecce, Italy) from June 29 to July 7, 1995.

DTIC

Conferences; Nonlinearity; Dynamic Models

71
ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see 45 Environmental Pollution.

19970019333 Naval Postgraduate School, Dept. of Computer Science, Monterey, CA USA

Headphone-Delivered Three Dimensional Sound in NPSNET

Biggs, Lloyd J., Naval Postgraduate School, USA; Sep. 1996; 141p; In English

Report No.(s): AD-A318844; No Copyright; Avail: CASI; A07, Hardcopy; A02, microfiche

The current MIDI-based sound system for the distributed virtual environment of NPSNET can only generate aural cues via loudspeaker delivery in two dimensions. to further increase the sense of immersion experienced in NPSNET, a sound system is needed which can generate aural cues via headphone delivery in three dimensions. The approach taken was to explore the different feasible methods of rendering and presenting headphone-delivered spatial sound. One alternative was to implement a sound server capable of the real-time rendering of three dimensional sounds. Another alternative was to create a library of pre-recorded positioned sound files. In software, new algorithms were developed to integrate the sound server into NPSNET and to provide a table lookup capability for NPSNET's new spatial sound file library. The result of this research is a sound server capable of rendering up to twenty-four simultaneous sounds for a single participant in NPSNET using off-the-shelf sound equipment and computer software. This sound server was tested during numerous demonstrations of NPSNET. This research provided another method of increasing a participant's level of immersion in NPSNET through the use of aural cues.

DTIC

Acoustics; Auditory Perception; Computer Programs; Algorithms; Signal Processing; Digital Systems

19970019384 Washington Univ., Applied Physics Lab., Seattle, WA USA
Synchronous Picosecond Sonoluminescence ***Final Report, 1 Jun. 1993 - 31 May 1996***
Crum, Lawrence A., Washington Univ., USA; Oct. 10, 1996; 169p; In English
Contract(s)/Grant(s): N00014-93-I-0322
Report No.(s): AD-A317384; APL-UW-1.LC.APL.96; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), microfiche

The discovery of single-bubble sonoluminescence has led to a number of interesting discoveries and provocative claims-among these are that hydrogen isotope fusion could be accomplished with a collapsing cavitation bubble and that the sonoluminescence emissions are first demonstration of quantum vacuum radiation. This project has sought to understand the nonlinear bubble dynamics associated with the phenomenon, and has specifically involved the conditions necessary for bubble levitation and sonoluminescence extinction.

DTIC

Acoustic Scattering; Energy Transfer; Sonoluminescence; Synchronism

19970019518 Naval Surface Warfare Center, Bethesda, MD USA
Phenomenon of Leaky Free Waves in the Modal Response of a Uniform Cylinder ***Topical Report, 1 Jan. - 31 Oct. 1996***
Maidanik, G., Naval Surface Warfare Center, USA; Becker, K. J., Naval Surface Warfare Center, USA; Oct. 31, 1996; 30p; In English
Report No.(s): AD-A320488; NSWCCD-SIG-96/120-7030; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The phenomenon of leaky free waves in the modal response of a uniform shell is manifest if (1) in the absence of fluid loading the locus of the free waves as a function of frequency crosses from the subsonic region to the supersonic region across the sonic locus and (2) in the presence of fluid loading the fluid surface impedance at and in the vicinity of the sonic locus is high and the introduction of this fluid loading does not prevent the free waves of concern from reaching the sonic locus. The phenomenon of leaky free waves in the modal response of a uniform cylinder is investigated. It is found that two distinct examples of leaky free waves are manifested. The first is associated with the flexural free waves that reside in a frequency range that lies above the critical frequency with respect to the speed of sound in the fluid and the second is associated with the curvature free waves that reside in a frequency range that lies below the ring frequency. The phenomenon of leaky free waves in these two examples is computed, displayed and discussed.

DTIC

Modal Response; Acoustic Emission; Wave Propagation

19970019585 Washington Univ., Applied Physics Lab., Seattle, WA USA
The Variability of High-Frequency Acoustic Backscatter from the Region Near the Sea Surface, Part 2 ***Final Report***
Dahl, Peter H., Washington Univ., USA; Plant, William J., Washington Univ., USA; Jan. 14, 1997; 20p; In English
Contract(s)/Grant(s): N00014-95-I-0048
Report No.(s): AD-A320425; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Simultaneous and coincident measurements of acoustic and microwave backscatter from the air/sea interface were obtained during Phase 2 of the SAXON-FPN experiment in December 1992 and again in March 1993. The acoustic and microwave grazing angles were both set to 17 degrees, and the wavelengths were matched, being set to 2.14, 3.00, and 5.66 cm, corresponding to, respectively, acoustic frequencies of 26.5, 50, and 70 kHz and microwave frequencies of 5.3, 10, and 14 GHz. The results of our experiments show that the two scattering strengths are comparable at wind speeds below about 3 m/s but that the acoustic scattering strength increases much faster than the microwave scattering strength with increasing wind speed until reaching saturation. The temporal variability of acoustic backscattering from the region near the sea surface is examined for frequencies in the 30- to 70-kHz range. A variance spectrum of the scattering strength exhibits effects associated with three different processes described in the paper.

DTIC

Acoustic Scattering; Ocean Surface; Air Water Interactions; Microwave Scattering; Backscattering; Acoustic Measurement

19970019601 NASA Langley Research Center, Hampton, VA USA
Optimizing an Actuator Array for the Control of Multi-Frequency Noise in Aircraft Interiors
Palumbo, D. L., NASA Langley Research Center, USA; Padula, S. L., NASA Langley Research Center, USA; 1997; 8p; In English; 3rd; Aeroacoustics, 12-14 May 1997, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA-TM-112847; NAS 1.15:112847; AIAA Paper 97-1615; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

Techniques developed for selecting an optimized actuator array for interior noise reduction at a single frequency are extended to the multi-frequency case. Transfer functions for 64 actuators were obtained at 5 frequencies from ground testing the rear section of a fully trimmed DC-9 fuselage. A single loudspeaker facing the left side of the aircraft was the primary source. A combinatorial search procedure (tabu search) was employed to find optimum actuator subsets of from 2 to 16 actuators. Noise reduction predictions derived from the transfer functions were used as a basis for evaluating actuator subsets during optimization. Results indicate that it is necessary to constrain actuator forces during optimization. Unconstrained optimizations selected actuators which require unrealistically large forces. Two methods of constraint are evaluated. It is shown that a fast, but approximate, method yields results equivalent to an accurate, but computationally expensive, method.
Author
Aircraft Noise; Aircraft Compartments; Noise Reduction; Actuators; Optimization; Position (Location)

19970019708 Pennsylvania State Univ., Sharon, PA USA
Computational Noise Study of a Supersonic Short Conical Plug-Nozzle Jet ***Final Report***
Das, Indu S., Pennsylvania State Univ., USA; Khavaran, Abbas, NYMA, Inc., USA; Das, A. P., Youngstown State Univ., USA; Sep. 1996; 86p; In English
Contract(s)/Grant(s): NAG3-1708
Report No.(s): NASA-CR-204473; NAS 1.26:204473; No Copyright; Avail: CASI; A05, Hardcopy; A01, microfiche

A computational jet noise study of a short conical plug-nozzle (CPN) is presented. The CPN has an exit diameter of 45 mm and the geometrical configuration closely approximates that of an ideal contoured plug-nozzle having shockless flow at pressure ratio xi(sub d) = 3.62. The gasdynamics of the jet flows have been predicted using the CFD code, NPARC with k-epsilon turbulence model; these data are then used for noise computations based on the modified GE/MGB code. The study covers a range of pressure ratio, 2.0 less than or equal to xi less than or equal to 5.0. The agreement of the computational results with the available experimental data is favorable. The results indicate consistent noise reduction effectiveness of the CPN as compared to equivalent convergent, convergent-divergent and ideal contoured plug nozzles at all pressure ratios. At design pressure ratio, codes predict noise levels within 4.0 dB of the measurements; and at off-design pressure ratios, in general, within 5.0 dB except at very high frequencies when deviations up to 10 dB are noted. The shock formation mechanism in the CPN jet is noted to be basically different from those in the convergent and CD nozzle jets.
Author
Plug Nozzles; Supersonic Nozzles; Aeroacoustics; Aerodynamic Noise; Jet Aircraft Noise; Conical Nozzles; Pressure Ratio; Noise Reduction

19970019887 Naval Command, Control and Ocean Surveillance Center, San Diego, CA USA
Comparison of Acoustic and Non-Acoustic Methods of Vertical Line Array Element Localization
Hodgkiss, W. S., Scripps Institution of Oceanography, USA; Ensberg, D. E., Scripps Institution of Oceanography, USA; D'Spain, G. L., Scripps Institution of Oceanography, USA; Booth, N. O., Naval Command, Control and Ocean Surveillance Center, USA; Schey, P. W., Naval Command, Control and Ocean Surveillance Center, USA; Jun. 1996; 9p
Report No.(s): AD-A315714; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

SWellEx-3 (Shallow Water evaluation cell Experiment 3) was conducted in July 1994 west of Point Loma in 200-m water. During the experiment, a MPL 64-element, 120-m aperture vertical array was deployed on the ocean bottom from the RIP FLIP. Located 2 m above the shallowest array element was a self-recording package equipped with depth, tilt, and direction-of-tilt sensors, thereby permitting array element localization (AEL) to be performed non-acoustically. In addition, AEL was performed acoustically using two different approaches. The first approach made use of transponder pings (in the vicinity of 12 kHz) received by high-frequency hydrophones spaced every 7.5 m along the vertical array. The second approach was based on a self-cohering technique where matched-field processing was performed on a low-frequency, multitone (50-200 Hz) sound source being towed at various ranges and azimuths from the array. The focus of this paper is on a comparison of the time-evolving array shape estimates generated by these three different methods. As shown, all three provide a consistent picture of array motion throughout the 6 hour period analyzed.
DTIC
Acoustic Delay Lines; Hydrophones; Shallow Water; Transponders

19970019894 Texas Univ., Applied research Labs., Austin, TX USA
Plasma Sound Source Basic Research ***Annual Report, 1 Jun. 1995 - 31 May 1996***
Rogers, Robert L., Texas Univ., USA; Jun. 19, 1996; 11p; In English
Contract(s)/Grant(s): N00014-94-I-0150

Report No.(s): AD-A319286; ARL-TL-AS-96-16; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

This research focuses on the problem of understanding the mechanisms by which the underwater spark is generated and the delivery of electrical energy to the arc load and ultimately the acoustic signal. Recent progress in numerical simulations of arc-generated bubbles in water show good agreement with experimental observations. The arc formation and dielectric breakdown of the water at moderate field strengths have been modeled with a fractal object. Good agreement with electrical characteristics has been obtained. The limitations of multi-gap electrodes in water have been characterized.

DTIC

Plasmas (Physics); Dielectrics; Field Strength; Sound Waves; Fractals

19970020036 Washington Univ., Applied Physics Lab., Seattle, WA USA

High Resolution Benthic Acoustic Measurement System ***Final Report***

Williams, K. L., Washington Univ., USA; Jumars, P. A., Washington Univ., USA; Jackson, Darrell R., Washington Univ., USA; Oct. 30, 1996; 3p; In English

Contract(s)/Grant(s): N00014-95-I-1300

Report No.(s): AD-A317690; No Copyright; Avail: CASI; A01, Hardcopy; A01, microfiche

This is a one year project to improve methods of acoustic observation of benthic change by developing a bottom mounted, circularly scanning sonar that permits remote observation of benthic biological activity at sampling rates as high as 10 scans/hour.

DTIC

Scanners; Ocean Bottom; Observation; Sonar

19970020055 Analytical Services and Materials, Inc., Hampton, VA USA

Effect of Pressure Gradients on Plate Response and Radiation in a Supersonic Turbulent Boundary Layer

Frendi, Abdelkader, Analytical Services and Materials, Inc., USA; Mar. 1997; 38p; In English

Contract(s)/Grant(s): NAS1-19700; NAS1-96014; RTOP 537-06-37-20

Report No.(s): NASA-CR-201691; NAS 1.26:201691; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Using the model developed by the author for zero-pressure gradient turbulent boundary layers, results are obtained for adverse and favorable pressure gradients. It is shown that when a flexible plate is located in an adverse pressure gradient area, it vibrates more than if it were in a favorable pressure gradient one. Therefore the noise generated by the plate in an adverse pressure gradient is much greater than that due to the plate in a favorable pressure gradient. The effects of Reynolds number and boundary layer thickness are also analyzed and found to have the same effect in both adverse and favorable pressure gradient cases. Increasing the Reynolds number is found to increase the loading on the plate and therefore acoustic radiation. An increase in boundary layer thickness is found to decrease the level of the high frequencies and therefore the response and radiation at these frequencies. The results are in good qualitative agreement with experimental measurements.

Author

Pressure Gradients; Supersonic Boundary Layers; Turbulent Boundary Layer; Boundary Layer Thickness; High Frequencies

19970020108 Washington Univ., Applied Physics Lab., Seattle, WA USA

High-Resolution Benthic Acoustic Measurement System ***Final Report***

Jackson, Darrell R., Washington Univ., USA; Williams, Kevin L., Washington Univ., USA; Oct. 30, 1996; 3p; In English

Contract(s)/Grant(s): N00014-95-I-1300

Report No.(s): AD-A317689; No Copyright; Avail: CASI; A01, Hardcopy; A01, microfiche

A new sonar system has been constructed and successfully fielded. The system, designated as the Accelerated Benthic Acoustic Measurement System (XBAMS), is an autonomous, bottom mounted, circularly scanning sonar that permits remote observation of benthic biological and physical processes over a large area (100 m diameter circle) and long times (weeks to months) in the littoral zone.

DTIC

Acoustic Measurement; Ocean Bottom; Sonar; Underwater Acoustics

19970020113 Texas Univ., Applied Research Labs., Austin, TX USA

New Multiple Scatter Model of the Ocean Sediment ***Final Report, 1 Jan. - 31 Aug. 1995***

Yelton, Dennis J., Texas Univ., USA; Stern, Morris, Texas Univ., USA; Chotiros, Nicholas P., Texas Univ., USA; Sep. 15, 1995; 66p; In English

Contract(s)/Grant(s): N00014-94-I-0438

Report No.(s): AD-A319310; ARL-TR-95-26; No Copyright; Avail: CASI; A04, Hardcopy; A01, microfiche

The reflection and scattering properties of an inhomogeneous poroelastic medium were studied via numerical simulation. The inhomogeneous medium was modeled as an ensemble average of randomly layered poroelastic material. Each layer represented a granular material of a particular grain size. The thickness of each layer was related to the associated grain size and porosity by a conservation of mass relationship. Lateral variations in grain size were approximated by performing a coherent ensemble average of results from several realizations of the randomly stratified medium. Poroelastic medium parameters were chosen to represent water-saturated sand. The mean and standard deviation of the grain size distribution were chosen to match existing experimental data so that the model could be tested. Specifically, the inhomogeneous medium was modeled as bounded by a homogeneous water half-space on the source side, and a homogeneous poroelastic half-space of equivalent average porosity on the other side. Reflected signals were computed for 500 kHz and 1 MHz normally incident plane waves. Coherent and random components of the reflected signal were calculated. The coherent part was directly related to the reflection coefficient. The random component was related to the scattering strength of the medium. It was found to increase with the mean grain size diameter, consistent with previous experimental results.
DTIC
Sediments; Acoustic Scattering; Underwater Acoustics; Grain Size; Size Distribution; Computerized Simulation

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

19970019304 Oak Ridge National Lab., TN USA
Diode laser excited optogalvanic spectroscopy of glow discharges
Barshick, C.M., Oak Ridge National Lab., USA; Shaw, R.W., Oak Ridge National Lab., USA; Post-Zwicker, A., Young, J.P., Oak Ridge National Lab., USA; Ramsey, J.M., Oak Ridge National Lab., USA; [1996]; 4p; In English; 8; International Symposium on Resonance Ionization Spectroscopy, 30 Jun. - 5 Jul. 1996, State College, PA, USA
Contract(s)/Grant(s): DE-AC05-96OR-22464
Report No.(s): CONF-960686-3; DE96-014601; No Copyright; Avail: CASI; A01, Hardcopy; A01, microfiche
The development of diode-laser-excited isotopically-selective optogalvanic spectroscopy (OGS) of uranium metal, oxide and fluoride in a glow discharge (GD) is presented. The technique is useful for determining isotopic ratios of U-235/(U-235 + U-238) in the above samples. The precision and accuracy of this determination is evaluated, and a study of experimental parameters pertaining to optimization of he measurement is discussed. Application of the GD-OGS to other f-transition elements is also described.
DOE
Optogalvanic Spectroscopy; Laser Spectroscopy; Uranium 235; Uranium 238; Uranium Oxides; Semiconductor Lasers; Isotope Ratios; Glow Discharges

19970019362 Joint Inst. for Nuclear Research, Frank Lab. of Neutron Physics, Dubna, USSR
Study of structural peculiarities of phase transition in N(H/D)(sub 4)SCN by neutron scattering *Issledovanie strukturnykh osobennostej fazovykh perekhodov v N(H/D)(sub 4)SCN metodom rasseyaniya nejtronov*
Dlouha, M., Czech Technical Univ., Czechoslovakia; Vratislav, S., Czech Technical Univ., Czechoslovakia; Natkaniec, I., Czech Technical Univ., Czechoslovakia; Smirnov, L. S., Joint Inst. for Nuclear Research, USSR; 1996; 14p; In Russian
Report No.(s): JINR-R-14-96-157; DE97-607152; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche; US Sales Only; US Sales Only
The results of the investigations of protonated and deuterated thiocyanate ammonium obtained with the help of the elastic coherent and inelastic incoherent neutron scattering are shown. Temperature dependencies of the monoclinic lattice parameters are presented and the increase of the c parameter with decrease of the temperature is exhibited. The change of the slope in temperature dependencies of monoclinic lattice parameters near 200 K is noticed which in accordance with the inelastic incoherent neutron scattering is due to freezing of the permutation reorientation of ammonium ions below this temperature.
DOE
Neutron Scattering; Ammonium Compounds; Deuterium Compounds; Lattice Parameters; Permutations

19970019363 Joint Inst. for Nuclear Research, Bogoliubov Lab. of Theoretical Physics, Dubna, USSR
Dynamics of carrions in the spin-fermion model
Kuzemskij, A. L., Joint Inst. for Nuclear Research, USSR; Marvakov, D., Sofia Univ., Bulgaria; 1996; 14p; In English

Report No.(s): JINR-E-17-96-99; DE97-607199; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche; US Sales Only; US Sales Only

The spectrum of hole quasiparticles (carrions) and the role of magnetic correlations has been considered in the framework of spin-fermion (Kondo-Heisenberg) model by means of the equation-of-motion method. The hole quasiparticle dynamics has been discussed for t-J model and compared with that of for spin-fermion model to determine how the one- and two-magnon processes define the true nature of carriers in HTSC. For this Kondo-Heisenberg-type model it was clearly pointed out on the self-energy level, beyond Hartree-Fock approximation, that two-magnon processes can play a role for the formation of the superconducting state.

DOE

Superconductivity; High Temperature Superconductors; Hartree Approximation; Fermions

19970019712 Georgia Univ., Dept. of Chemistry, Athens, GA USA

Atomic Level Studies of Se Electrodeposition on Au(111) and Au(110), *1 Jun. 1995 - 15 Oct. 1996*

Lister, Tedd E., Georgia Univ., USA; Stickney, John L., Georgia Univ., USA; Oct. 15, 1996; 44p; In English

Contract(s)/Grant(s): N00014-91-J-1919

Report No.(s): AD-A317318; GU-TR-24; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Studies of the electrodeposition of Se atomic layers of Au(111) and Au(110) are presented. Three electrochemical methods of forming Se atomic layers were investigated: reductive deposition, oxidative stripping of bulk Se, and reductive stripping of bulk Se. The resulting Se atomic layers were studied using low energy electron diffraction (LEED), Auger electron spectroscopy (AES), and scanning tunneling microscopy (STM). LEED indicated the formation of Au(111) (square root of 3 X square of 3)R30 deg-Se and Au(110)(2 X 3)-Se structures. STM analysis confirmed the presence of those structures along with several others. At low Se coverages on A u(111), a mosaic structure was formed, composed of a large number of small domains of a (square root of 3 X square root of 3)R30 deg-Se structure, separated by areas void of Se. At higher coverages, near 1/3, the (square root of 3 X square root of 3)R30 deg structure covered most of the surface, except for a number of linear phase boundaries. Commensurate with completion of the (square root of 3 X square root of 3)R30 deg structure, some domains of square Se8 rings were usually evident, as well. At still higher coverages, a heterogeneous surface was formed, composed of a complex network of rings, chains, clusters and pits. This heterogeneity appears to result from slow deposition kinetics, probably the result of both a low exchange current and Se surface mobility.

DTIC

Electrodeposition; Selenium; Gold; Atomic Energy Levels; Electron Spectroscopy; Auger Spectroscopy; Surface Properties

19970020104 Utah Univ., Dept. of Chemistry, Salt Lake City, UT USA

Fourth Conference on Molecular Reaction Dynamics in Condensed Matter *Final Report, 15 Oct. 1995 - 14 Oct. 1996*

Wight, Charles A., Utah Univ., USA; Jan. 1996; 14p; In English, 7-10 Frb. 1995, Newport Beach, CA, USA

Contract(s)/Grant(s): F49620-96-I-0010; AF Proj. 2303

Report No.(s): AD-A317353; AFOSR-TR-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

A principle goal of the conference was accomplished, which is extremely relevant to the AFSOR mission. As stated in the original proposal to AFOSR, we brought together top people in academic research condensed matter dynamics community, with experts in shock waves and energetic materials. For example, Marvin Ross (LLNL), Yogi Gupta (Washington State), James Belak (LLNL), and Craig Tarver (LLNL) talked about shock waves and initiation phenomena, introducing the most interesting and relevant results in these fields to the academic scientists. A high point of the meeting was Prof. Suslick's talk about material synthesis using shock wave via sonochemistry. Many of the academic scientists commented to me how were the problems in these fields and kn ow nice an introduction the a impact with their theoretical models and technologies. Conversely, the shock people were extremely pleased to be provided an introduction to the state of the art in condensed matter dynamics.

DTIC

Condensed Matter Physics; Conferences; Molecular Dynamics; Shock Waves

19970020116 California Inst. of Tech., Div. of Chemistry and Chemical Engineering, Pasadena, CA USA

Laser Probing of Cross Sections for Ionization of Excited States and Molecular Dissociation by Electron Impact *Final Report, 1 Aug. 1992 - 31 Jul. 1996*

McKoy, Vincent, California Inst. of Tech., USA; Srivastava, Santosh, California Inst. of Tech., USA; Jul. 1996; 15p; In English

Contract(s)/Grant(s): F49620-92-J-0435

Report No.(s): AD-A320236; AFOSR-TR-97-0014; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Cross sections for electron-impact ionization of atoms and molecules and for electron-impact dissociation of molecules play an important role in determining the properties of electrical discharges, of the ionosphere and aurora, and of the plasmas that are widely used in microelectronics fabrication. The data base of these electron collision cross sections is very fragmentary or non-existent. This research has addressed these needs through the following accomplishments: Development, and application of a novel method for the measurement of accurate values of ionization cross sections of metal atoms. The discovery that the values of the ionization potential of C60 determined by the electron-impact and photoionization methods differ considerably indicating that low-lying metastable states are involved in the process. This may very well be the case for many other large molecules. Development of a time-of-flight, mass spectrometer of special design required for this effort.
DTIC
Electric Discharges; Electron Impact; Dissociation; Ionization Cross Sections; Microelectronics; Fabrication; Ionization Potentials; Photoionization; Molecular Energy Levels

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NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory. For space radiation see 93 Space Radiation.

19970019318 Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro, Brazil
On the Dalitz plot approach in non-leptonic charm meson decays
Bediaga, I., Centro Brasileiro de Pesquisas Fisicas, Brazil; Goebel, C., Centro Brasileiro de Pesquisas Fisicas, Brazil; Mendez-Galain, R., Universidad de la Republica, Uruguay; May 1996; ISSN 0029-3865; 13p; In English
Report No.(s): CBPF-NF-029/96; DE97-604651; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche
We show that the non-resonant contribution to non-leptonic charm meson decays can not be considered constant in the phase space of the reaction as it usually is. We argue that this is relevant for any weak reaction. We discuss in detail the decay D(sup +) yields K(sup -) pi(sup +) pi(sup +).
DOE
Particle Decay; Mesons; Charm (Particle Physics)

19970019364 Joint Inst. for Nuclear Research, Lab. of High Energy Physics, Dubna, USSR
Numerical Study of the influence of a ribbon geometry of experiment on measuring particle angular distributions *Chislennoe izuchenie vliyaniya lentochnoj geometrii ehksperimenta na izmerenie uglovykh raspredelenij chastits*
Artemov, A. S., Joint Inst. for Nuclear Research, USSR; 1996; 15p; In Russian
Report No.(s): JINR-R-13-96-54; DE97-607170; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche; US Sales Only; US Sales Only
The values and nature of systematic errors in small-angle particle scattering experiments using ribbon-like beams are investigated by numerical simulation. As shown, the extent of the influence of a ribbon geometry of experiment on the result of measurement is significantly dependent on the shape of the measured angular distribution in an elementary act of interaction. The algorithm of experimental material treatment, obtained in measuring the widths at half maximum of the angular differential cross sections of secondary particles, is presented using an example of specific distributions and certain experimental setup.
DOE
Scattering Cross Sections; Angular Distribution; Ribbons; Numerical Analysis

19970019513 Netherlands Energy Research Foundation, Petten, Netherlands
EXOTIC-7: Irradiation of ceramic breeder materials to high lithium burnup
Laan, J.G. van der, Netherlands Energy Research Foundation, Netherlands; Kwast, H., Netherlands Energy Research Foundation, Netherlands; Stijkel, M., Netherlands Energy Research Foundation, Netherlands; Conrad, R., Commission of the European Communities, Netherlands; May, R., Commission of the European Communities, Netherlands; Casadio, S., European Nuclear Energy Agency, Italy; Roux, N., Commissariat a l'Energie Atomique, France; Werle, H., Forschungszentrum Karlsruhe G.m.b.H., Germany; Verrall, R.A., Atomic Energy of Canada Ltd., Canada; Feb. 1996; 26p; In English; Icfrm-7: International Conference on Fusion Reactor Materials, 25 - 29 Sep. 1995, Obninsk, Russian Federation
Report No.(s): ECN-RX-95-071; DE97-609999; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche
The EXOTIC-7 irradiation experiment in the High Flux Reactor (HFR) at Petten has been completed. Its aim has been to investigate the effects of high lithium-burnup on the mechanical stability and tritium release characterisitcs of candidate ceramic breeder materials, originating from the Fusion Programmes of CEA, FZK, ENEA, AECL and ECN. The tested ceramic breeder

materials were pellets of Li2ZrO3, LiAlO2 and Li8ZrO6 and pebbles of Li4SiO4 and Li2ZrO3, with a variety of characteristics, like grain size and porostiy. The test matrix provided the simultaneous irradiation of eight independent capsules with on-line tritium monitoring. Two capsules contains a mixture of Li4SiO4 and beryllium pebbles. The experimental design, sample loading and main radiation parameters are described. Some PIE results and analysis of in-situ tritium release behaviour are presented.
DOE
Tritium; Pellets; Lithium; Irradiation; Beryllium

19970019564 Los Alamos National Lab., NM USA
Klystron beam-bunching lecture
Carlsten, B., Los Alamos National Lab., USA; [1996]; 33p; In English; Particle Acceleration School, 9-15 Sep. 1996, Shonan Village, Japan
Contract(s)/Grant(s): W-7405-eng-36
Report No.(s): LA-UR-96-3061; CONF-9609245-1; DE96-014710; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Electron beam current modulation in a klystron is the key phenomenon that accounts for klystron gain and rf power generation. Current modulation results from the beams' interaction with the rf fields in a cavity, and in turn is responsible for driving modulation in the next rf cavity. to understand the impact of the current modulation in a klystron, we have to understand both the mechanism leading to the generation of the current modulation and the interaction of a current-modulated electron beam with an rf cavity. The cavity interaction is subtle, because the fields in the cavity modify the bunching of the beam within the cavity itself (usually very dramatically). We will establish the necessary formalism to understand klystron bunching phenomena which can be used to describe rf accelerator cavity/beam interactions. This formalism is strictly steady-state; no transient behavior will be considered. In particular, we will discuss the following: general description of klystron operation; beam harmonic current; how beam velocity modulation induced by an rf cavity leads to current modulation in both the ballistic and space-charge dominated regimes; use of Ramo's theorem to define the power transfer between a bunched electron beam and the cavity; general cavity model with external coupling (including an external generator if needed), used to describe the input cavity, idler cavities, and the output cavity, including the definition of beam loaded-cavity impedance. Although all these are conceptually straight-forward, they represent a fair amount of physics, and to derive some elements of the formalism from first principles requires excessive steps. Our approach will be to present a self-consistent set of equations to provide a mechanism that leads to a quantifiable description of klystron behavior; derivations for moderately complex formulas will be outlined, and a relatively complex derivation of the self-consistent set of equations can be found in the Appendix.
DOE
Beam Interactions; Electron Beams; Electron Bunching; Radio Frequencies; Klystrons; Modulation; Beam Currents

19970019906 Ceskoslovenska Akademie Ved, Inst. of Plasma Physics, Prague, Czechoslovakia
Proceedings of the 11th International Conference on High Power Particle Beams, Volume 2
Jungwirth, Karel, Editor, Ceskoslovenska Akademie Ved, Czechoslovakia; Ullschmied, Jiri, Editor, Ceskoslovenska Akademie Ved, Czechoslovakia; Jun. 14, 1996; 699p; In English, 10-14 Jun. 1996, Prague, Czechoslovakia
Report No.(s): AD-A319020; No Copyright; Avail: CASI; A99, Hardcopy; A06, microfiche

This report is the published Proceedings of the 11th International Conference on High Power Particle Beams.
DTIC
Particle Beams; Electron Acceleration; Magnetic Sails

19970020063 Japan Atomic Energy Research Inst., Tokai, Japan
Minutes of the second IFMIF-CDA design integration workshop
Maekawa, Hiroshi, Editor, Japan Atomic Energy Research Inst., Japan; Konishi, Satoshi, Editor, Japan Atomic Energy Research Inst., Japan; Aug. 1996; 400p; In English; 2; Ifmif-cda Design Integration Workshop, 20 - 25 May 1996, Tokai, Japan
Report No.(s): JAERI-Conf-96-012; CONF-9605235-; DE97-711111; No Copyright; Avail: CASI; A17, Hardcopy; A04, microfiche

The second Design Integration Workshop of IFMIF-CDA was held on May 20-27, 1996 at JAERI/Tokai. The primary objectives were, (1) to review and update the Baseline Design Concept, (2) to review the preliminary schedule and cost estimates, and (3) to establish the R and D needs for the next phase of the activity. This report presents a brief summary of the objective and results of the meeting. Detailed information on the agenda, attendees, and presentation material is included in the Appendix.
DOE
Research and Development; Production Management; Project Management

19970020340 Comitato Nazionale per L'Energia Nucleare, Centro Ricerche Rotondella (Materia), Trisaia, Italy
Nuclear criticality safety and time reactivity enhancement aspects of energy amplifier system devices
Siciliano, F., Comitato Nazionale per L'Energia Nucleare, Italy; Dec. 1995; ISSN 0393-3016; 73p; In English
Report No.(s): ENEA-RT-GEN-95-01; RT/GEN-95-01; DE97-713451; No Copyright; Avail: CASI; A04, Hardcopy; A01, microfiche; US Sales Only; US Sales Only

As far as the Rubbia's and colleagues proposal of innovating Energy Amplifier system (E.A.s.) device driven by a particle beam accelerator is concerned, four basic topics are comprised in the present paper: (1) A short outline of the nuclear aspects of Th-U and U-Pu fuel cycles regarding their general breeding and efficiency features. (2) The needed nuclear criticality control requirements have been studied in terms of safety regulating parameters on the basis of the ThO2 mixed oxides selected as fuel kind for the E.A.s. device technology development. Particular attention is devoted to time evolution of neutron multiplication factor since delayed development of the 233U buildup and so system reactivity are expected in the Th-U cycle. (3) Code E.A.s. device irradiation and post-irradiation modelling for determining higher actinides buildup, fission products formation and fuel consumption trends as function of time, system enrichment degree and flux level parameters. (4) The confirmation, on the basis of the same specific power irradiation, of expected actinides waste obtainment cleaner than the one deriving from the U-Pu cycle utilization. For this end, a model comparison of equivalent enriched fissile nuclides in both cycles has been devised as having, within the range of 0-700 days, ten irradiation periods of about 53 MW/ton specific power and equivalent cooling time post-irradiation periods.
DOE
Breeder Reactors; Fission Products; Fuel Consumption; Particle Beams; Radiation Protection; Safety; Thorium Oxides; Actinide Series; Particle Accelerators; Nuclear Fuel Reprocessing; Reactivity; Amplifiers

19970020378 Joint Inst. for Nuclear Research, Dubna, USSR
Z-scaling in hadron-hadron collisions at high energies, Volume 28
Zborovsky, I., Ceskoslovenska Akademie Ved, Czechoslovakia; Panebrattsev, Yu.A., Joint Inst. for Nuclear Research, USSR; Tokarev, M.V., Joint Inst. for Nuclear Research, USSR; Skoro, G.P., Institut za Nuklearne Nauke Boris Kidric, Yugoslavia; 1996; 16p; In English
Report No.(s): JINR-E-2-96-148; DE97-606934; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche; US Sales Only; US Sales Only

New scaling, z-scaling, in the inclusive particle production (charged hadrons, pi(sup (+/-)), K(sup (+/-)), gamma) in pp/p-bar p-collisions is predicted. The scaling function H(z) is expressed via the Ed(exp 3) sigma/dq(exp 3) inclusive cross section of particle production and particle multiplicity density dN/d(eta) at pseudorapidity eta = 0. The dependence of H(z) on scaling variable z = square root of s(sub x)/(Delta M center dot dN/d(eta) (0)), the center-of-mass energy square root of s and the detection angle (theta) is investigated. The symmetry properties of scaling function H(z) are found. It is shown that H(z) for the secondary particle momenta q greater than 0.4 GeV/c is independent of square root of s and theta in a wide kinematic range of particle production. The available experimental data confirm the universality of the H(z) function. Some predictions for H(z) of (pi)(+/-), K(+/-), gamma particles using the HIJING Monte Carlo code have been made. The obtained results can be of interest for future experiments at RHIC and LHC.
DOE
Particle Production; Proton-Proton Reactions; Particle Interactions; Scaling Laws; Antiprotons; Hadrons

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OPTICS

Includes light phenomena; and optical devices. For lasers see 36 Lasers and Masers.

19970019296 Naval Research Lab., Washington, DC USA
Simple Theory of the Input Coupler to the 94 GHz NRL Gyroklystron ***Interim Report***
Manheimer, Wallace M., Naval Research Lab., USA; Oct. 31, 1996; 27p; In English
Report No.(s): AD-A317832; NRL/MR/6707-96-7891; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

This Memorandum Report formulates simple approaches to the coupling problem in the NRL 94 GHz gyroklystron. It looks at the coupling holes between the coaxial cavity and main cavity as simple dipoles. It looks at the coupling between the input waveguide and coaxial cavity as either a dipole, or a waveguide T.
DTIC
Klystrons; Couplers; Cavities; Waveguides; Dipoles

19970019361 NASA Ames Research Center, Moffett Field, CA USA

Spectral Irradiance Calibration in the Infrared, Part 7, New Composite Spectra, Comparison with Model Atmospheres, and Far-Infrared Extrapolations

Cohen, Martin, California Univ., USA; Witteborn, Fred C., NASA Ames Research Center, USA; Carbon, Duane F., NASA Ames Research Center, USA; Davies, John K., Joint Astronomy Centre, USA; Wooden, Diane H., NASA Ames Research Center, USA; Bregman, Jesse D., NASA Ames Research Center, USA; Astronomical Journal; Nov. 1966; ISSN 0004-6256; Volume 112, No. 5, pp. 2274-2285; In English

Contract(s)/Grant(s): NCC2-142; NAGw-4201; F19628-92-C-0090

Report No.(s): NASA-CR-203117; NAS 1.26:203117; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, microfiche

We present five new absolutely calibrated continuous stellar spectra constructed as far as possible from spectral fragments observed from the ground, the Kuiper Airborne Observatory (KAO), and the IRAS Low Resolution Spectrometer. These stars-alpha Boo, gamma Dra, alpha Cet, gamma Cru, and mu UMa-augment our six, published, absolutely calibrated spectra of K and early-M giants. All spectra have a common calibration pedigree. A revised composite for alpha Boo has been constructed from higher quality spectral fragments than our previously published one. The spectrum of gamma Dra was created in direct response to the needs of instruments aboard the Infrared Space Observatory (ISO); this star's location near the north ecliptic pole renders it highly visible throughout the mission. We compare all our low-resolution composite spectra with Kurucz model atmospheres and find good agreement in shape, with the obvious exception of the SiO fundamental, still lacking in current grids of model atmospheres. The CO fundamental seems slightly too deep in these models, but this could reflect our use of generic models with solar metal abundances rather than models specific to the metallicities of the individual stars. Angular diameters derived from these spectra and models are in excellent agreement with the best observed diameters. The ratio of our adopted Sirius and Vega models is vindicated by spectral observations. We compare IRAS fluxes predicted from our cool stellar spectra with those observed and conclude that, at 12 and 25 microns, flux densities measured by IRAS should be revised downwards by about 4.1% and 5.7%, respectively, for consistency with our absolute calibration. We have provided extrapolated continuum versions of these spectra to 300 microns, in direct support of ISO (PHT and LWS instruments). These spectra are consistent with IRAS flux densities at 60 and 100 microns.

Author

Spectral Emission; Calibrating; Infrared Spectra; Atmospheric Models; Extrapolation

19970019387 Army Research Lab., Battlefield Environment Directorate, White Sands Missle Range, NM USA

UVTRAN: An Ultraviolet Transmission and Lidar Simulation Model ***Final Report***

Gillespie, James B., Army Research Lab., USA; Patterson, Edward M., Georgia Inst. of Tech., USA; Oct. 1996; 79p; In English

Report No.(s): AD-A317395; ARL-TR-273-7; No Copyright; Avail: CASI; A05, Hardcopy; A01, microfiche

UVTRAN is a user friendly, ultraviolet and visible wavelength, propagation and lidar model. The computer program is available as both a generic FORTRAN code and as a mighty interactive Visual Basic Ver. 3, MS Windows. The transmission code currently uses a modified Koshmeider aerosol model for the aerosol attenuation. It uses a modified Rayleigh scattering model for the attenuation due to molecular scattering, and it uses average molecular absorption data for ozone, oxygen and trace gas attenuation. The wavelength range is 200 to 700 nm. The principle inputs are: range in kilometers, visibility in kilometers, and wavelength in nanometers. Other inputs are: gas concentration in parts per billion, the wavelength interval for calculations, and the range information (starting and ending ranges), and the interval for the range calculation. Default values are built into the model if the user does not know sensible values to use. The last values used in a calculation are saved and can be reused for the next calculations. A 1976 standard atmosphere is used for gas concentration but can be user defined. The Windows version of the program has plotting capability while the FORTRAN version allows the information to be printed to a data file and plotted externally. This version also has options for viewing and printing the date. The lidar model includes the UVTRAN model for the two-way atmospheric attenuation of the beam. The lidar model performs standard elastic back scattering calculations as a function of range, and it will also perform fluorescence lidar calculations. Inputs are the same for the UVTRAN model, but also include the likar inputs such as back scattering cross section (or fluorescence back scattering) and the lidar system parameters (wavelength, power, mirror size, system efficiency).

DTIC

Computer Programs; Ultraviolet Radiation; Applications Programs (Computers); Optical Radar; Light Transmission

19970019499 California Univ., Dept. of Materials Science and Engineering, Los Angeles, CA USA

Gradient Index Lenses From Sol-Gel Layering ***Final Report, 1 Jul. 1993 - 30 Jun. 1996***

Mackenzie, John D., California Univ., USA; Jun. 30, 1996; 22p; In English

Contract(s)/Grant(s): F49620-93-I-0364; AF Proj. 3484
Report No.(s): AD-A316337; AFOSR-TR-96-0491; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

This is the third and final annual technical report of an AASERT grant award covering the period from 1 July 1993 to 30 June 1996. The research proposed is based on the concept of the liquid gradient density column, which is used to measure the density of doped semiconductors. This technique uses a column made from two miscible liquids of different densities, configured to exhibit a continuous variation in density from the bottom to the top of the column. With the most dense liquid at the bottom and the lighter liquid at the top, the gradient is a function of the starting densities of the starting materials. Such gradient columns are stable up to several months and allow an accuracy in density measurement of up to five significant digits. It is assumed that density differences can be directly correlated with differences in refractive index. In this research the principle of the gradient density column is applied to the sol-gel process. The sol-gel process has been widely studied in the recent past, as it is an interesting alternative chemical route to conventional glass and ceramics processing.

DTIC

Sol-Gel Processes; Ceramics; Doped Crystals; Lenses; Semiconductors (Materials); Density Measurement; Measuring Instruments; Fabrication

19970019555 Michigan Univ., Dept. of Electrical Engineering and Computer Science, Ann Arbor, MI USA

Optoelectronic MQW Devices and Systems for Application in Optically Controlled Millimeter-Wave Oscillators ***Final Report, May 1992 - Dec. 1995***

Bhattacharya, P., Michigan Univ., USA; Haddad, G. I., Michigan Univ., USA; Singh, J., Michigan Univ., USA; Oct. 1996; 169p; In English
Contract(s)/Grant(s): F30602-92-C-0087; AF Proj. H556
Report No.(s): AD-A318135; RL-TR-96-162; No Copyright; Avail: CASI; A08, Hardcopy; A02, microfiche

The objective of this program was the realization of optically controlled millimeter wave and microwave GaAs and InP based circuits. The primary goal was the development of heterojunction bipolar transistors (HBTs) with the ability to be controlled optically. of particular interest is the ability to convert a microwave signal modulated onto an optical carrier into an electrical signal which in turn will be used to injection lock a microwave oscillator. This optically injection locked oscillator has application to optically implemented control of phased array antenna systems. This report documents significant device developments such as a high frequency, discrete device for injection locking (lnP based MODFET with fmax approx. 300 GHz; GaAs based HBTs with fmax approx. 90GHz; lnP based HBTs with fmax approx. 110 GHz), an Indium-Tin-Oxide (ITO) transparent ohmic contact technology, a high speed Barrier Reservoir and Quantum Well Electron Transport (BRAQWET) modulator (17 GHz bandwidth in GaAs based devices), and monolithically integrated oscillator circuits with guided wave optical injection with tuning range of 100 MHz injection locked at 14 GHz.

DTIC

Millimeter Waves; Integrated Circuits; Microwave Oscillators; Optoelectronic Devices; Antenna Arrays; Antenna Design; Bipolar Transistors

19970019635 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Demonstrating Optical Aberration Correction With a Mems Micro-Mirror Device

Hick, Shaun R., Air Force Inst. of Tech., USA; Dec. 1996; 104p; In English
Report No.(s): AD-A319052; AFIT/GAP/ENP/96D-07; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

This research conducted the first demonstrated use of a micro-electro-mechanical structure (MEMS) mirror array to correct a static optical aberration. A well developed technique in adaptive optics imaging systems uses a deformable mirror to reflect the incident wave front to the imaging stage of the system. by matching the surface of the deformable mirror to the shape of the wave front phase distortion, the reflected wave front will be less aberrated before it is imaged. Typical adaptive optics systems use piezoelectric actuated deformable mirrors. This research used an electrostatically actuated, segmented mirror array, constructed by standard MEMS fabrication techniques, to investigate its performance as a deformable mirror. The relatively cheap cost of MEMS fabrication promises new adaptive optics applications if a suitable design can be found. In the demonstration, the point spread function (PSF) of the corrected and uncorrected aberrated image were compared. A 43 percent improvement in the peak intensity of the PSF was noted in the corrected image.

DTIC

Adaptive Optics; Electro-Optics; Aberration; Fabrication; Reflected Waves; Imaging Techniques; Segmented Mirrors; Image Processing

19970019706 Alabama Univ., Huntsville, AL USA
Determination and Control of Optical and X-Ray Wave Fronts ***Final Report, Jul. 1993 - May 1997***
Kim, Young K., Alabama Univ., USA; May 27, 1997; 182p; In English
Contract(s)/Grant(s): NAS8-38609
Report No.(s): NASA-CR-204536; NAS 1.26:204536; UAH-5-33304; UAH-5-33305; No Copyright; Avail: CASI; A09, Hardcopy; A02, microfiche

A successful design of a space-based or ground optical system requires an iterative procedure which includes the kinematics and dynamics of the system in operating environment, control synthesis and verification. to facilitate the task of designing optical wave front control systems being developed at NASA/MSFC, a multi-discipline dynamics and control tool has been developed by utilizing TREETOPS, a multi-body dynamics and control simulation, NASTRAN and MATLAB. Dynamics and control models of STABLE and ARIS were developed for TREETOPS simulation, and their simulation results are documented in this report. Author

Dynamic Control; Control Simulation; Wave Fronts; Optical Control; Iteration

19970019739 Environmental Research Inst. of Michigan, Electro-Optical Science Lab., Ann Arbor, MI USA
Utility Analysis of High-Resolution Multispectral Imagery, Volume 4, Image Based Sensor Model (IBSM) ***Final Report***
Eismann, M. T., Environmental Research Inst. of Michigan, USA; Ingle, S. D., Environmental Research Inst. of Michigan, USA; Slyz, M., Environmental Research Inst. of Michigan, USA; Mar. 1996; 136p; In English
Contract(s)/Grant(s): DLA900-88-D-0392
Report No.(s): AD-A317762; ERIM-253885-4-F-Vol-4; No Copyright; Avail: CASI; A07, Hardcopy; A02, microfiche

The Image Based Sensor Model (IBSM) is a modular set of numerical tools for designing, evaluating, and modeling electro-optical and infrared (EO/IR) imaging sensors. The primary motivation which led to the development of IBSM was the need for a model which (a) could produce simulated sensor imagery (based on high fidelity input imagery) in addition to sensor performance metrics to better characterize the imaging performance of a sensor system, and (b) provides the flexibility to evaluate and compare sensors and imaging configurations with differing characteristics without rewriting computer code. The model operates within the Khoros Cantata environment, and can perform realistic simulation of image degradations and parametric modeling with a wide range of atmospheric, sensor, data link, and processing effects. This report provides a comprehensive overview of the model.

DTIC

Infrared Imagery; Imaging Techniques; Electro-Optics; Computer Programs

19970019751 TRW Systems Group, Redondo Beach, CA USA
Fabrication of a 20.5 Inch Diameter Segmented Silicon Annular Optic Prototype for the ROMA Program
Hassell, Frank R., TRW Systems Group, USA; Sep. 1996; 15p; In English
Contract(s)/Grant(s): SDIO-89-C-0003; GH8-180564
Report No.(s): AD-A320096; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Recent advancements in single crystal silicon material science and fabrication capabilities and Very Low Absorption (VLA) multi-layer dielectric coating technology have led to the development of uncooled, large aperture, high power mirrors for High Energy Laser (HEL) systems. Based on this success, a segmented single-crystal silicon substrate concept has been selected as the baseline fabrication approach for uncooled 1.2 meter diameter resonator annular optics for the Alpha space based high energy laser. The objective of this Resonator Optics Materials Assessment (ROMA) task was to demonstrate all of the key fabrication processes required to fabricate the full sized annular optics for the Alpha space based high energy laser. This paper documents the fabrication of a half-scale Annular Optic Prototype (AOP) of the Alpha laser rear cone.

DTIC

Fabrication; Silicon; Coating; Prototypes

19970019888 Radex, Inc., Bedford, MA USA
Implementation of an Automated Method for Registration of FLIR Images ***Topical Report***
Ayer, S. M., Radex, Inc., USA; Jul. 23, 1996; 26p; In English
Contract(s)/Grant(s): F19628-95-C-0106; AF Proj. 7659
Report No.(s): AD-A317257; RXR-96072; PL-TR-96-2205; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The implementation of a method for registration of digital images recorded by a 8-12 micron Forward-Looking Infrared (FLIR) camera is described. The software runs independently of commercial software packages under the Silicon Graphics IRIX 5.3 environment that is used to create and store the images as movies. It is capable of registering and drift compensating entire

movies -- filtering against any number of reference images -- in one step in less than one second per frame per reference image, each of which is approximately 10,000 pixels. The package was written in C, and is herein described in detail from both methodology and implementation perspectives.
DTIC
FLIR Detectors; Images; Algorithms; Image Processing; Infrared Photography; Applications Programs (Computers)

19970019903 Connecticut Univ., Dept. of Mathematics, Storrs, CT USA
Photon-Limited Image Detection Using Shot-Noise Models ***Final Report, 1 Jul. 1992 - 30 Jun. 1996***
Gubner, John A., Connecticut Univ., USA; Aug. 31, 1996; 6p; In English
Contract(s)/Grant(s): F49620-92-J-0305; AF Proj. 2304
Report No.(s): AD-A319827; AFOSR-TR-97-0013; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

The objective of this research continues to be the study of shot noise models and their application to the development of computationally feasible procedures for image detection problems. Also of interest is the performance evaluation of these procedures. These efforts are motivated by applications to low light level imaging as would occur in low dose x ray exposures or in night vision systems. Results are also be applicable to photon limited optical communication systems and to optical neural networks. Considerable progress has been made in understanding shot noise. The three major results of our research are: (1) methods for computing shot noise distributions when both the intensity function and the system impulse response are known; (2) methods for estimating an unknown intensity when only the impulse response is known; and (3) methods for jointly estimating the intensity and the impulse response when both are unknown (a type of blind deconvolution).
DTIC
Photons; Imaging Techniques; Shot Noise

19970019920 BDM International, Inc., Arlington, VA USA
Folded Interconnection Network Development ***Final Report, 15 Sep. 1992 - 14 Sep 1996***
Chistensen, Marc P., BDM International, Inc., USA; Haney, Michael W., BDM International, Inc., USA; 1996; 113p; In English
Contract(s)/Grant(s): F49620-92-C-0062; AF Proj. 8545
Report No.(s): AD-A320420; BDM/VAS-MPC-96010; AFOSR-TR-97-0066; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

The objective of the Folded Interconnection Network Development (FIND) program was to combine the rapidly emerging vertical cavity' surface emitting laser (VCSEL) based 'smart pixel' technology with a new free-space optical interconnection (FSOI) architecture which maximally exploits the ability of three dimensional free space optics to overcome the interconnection bottlenecks of multiprocessor systems. to focus the research, ultrahigh throughput (Tbit/sec) packet switching was selected as the key application are a. The, FIND program analytical results included a comparison of FSOI-based approaches with the traditional chip-multi-chip-module/printed circuit board metallic interconnection hierarchy. This analysis yielded fundamental scaling laws based on the geometrical constraints associated with implementing high bisection bandwidth networks. The results proved that FSOI provides orders of magnitude advantage in size, weight, and power consumption for multiprocessor networks with bisection bandwidths greater than about 1 Tbit/sec. The experimental portions of the FIND program focused on the optomechanical issues related to the MCM based retroreflective architecture. A one lens per chip design philosophy was adopted. Key optical elements of the package were evaluated with one dimensional and two dimensional arrays of VCSELs. An optical interconnection module was then designed and fabricated. The module achieved 10 micron resolution and registration accuracy across an entire 10 X 10 cm multichip substrate.
DTIC
Optical Properties; Optical Equipment; Printed Circuits; Surface Emitting Lasers; Fabrication; Laser Cavities; Lens Design

19970019944 Wisconsin Univ., Madison, WI USA
Scanning Microcathodoluminescence and Near-Field Optical Scanning Microscopy of Nanostructures in Semiconductors (AASERT Award) ***Final Report***
Lagally, Max G., Wisconsin Univ., USA; Dec. 02, 1996; 6p; In English
Contract(s)/Grant(s): N00014-93-I-0910
Report No.(s): AD-A319709; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

This report briefly summarizes work completed on the above grant during the time period of June 1, 1993 to May 31, 1996. The grant, an AASERT Award to support the work of one graduate student, supplemented a larger ONR grant (N00014-90-J-1306) and expanded the effort in that grant to scanning tunneling luminescence(STL) microcathodoluminescence (micro CL), and near-field scanning optical microscopy (NSOM). The objective has been to use these new techniques for investigating local optical

properties of surfaces and small structures and relating these to morphological properties and structural defects. The project has been quite successful, in that we were able to develop a functional STL capability and use it for initial studies of localized luminescence on GaAs and GaN. In addition, the objective motivated research on improved scanning technology for scanned-probe instruments, which has led to an invention disclosure and the filing of a patent application by the University.
DTIC
Gallium Arsenides; Near Fields; Gallium Nitrides; Cathodoluminescence; Defects; Microscopy; Optical Scanners

19970019983 NASA Goddard Space Flight Center, Greenbelt, MD USA
End-to-End System Test and Optical Performance Evaluation for the Solar and Heliosphere Observatory (SOHO) Ultraviolet Coronagraph Spectrometer (UVCS)
Carosso, Paolo A., Swales and Associates, USA; Gardner, Larry D., Harvard-Smithsonian Center for Astrophysics, USA; Jhabvala, Marzy, NASA Goddard Space Flight Center, USA; Nicolosi, P., Padua Univ., Italy; Nineteenth Space Simulation Conference Cost Effective Testing for the 21st Century; Jan. 1997, pp. 231-250; In English; Also announced as 19970019961
Contract(s)/Grant(s): NAS5-31250; No Copyright; Avail: CASI; A03, Hardcopy; A04, microfiche

The UVCS is one of the instruments carried by the Solar and Heliospheric Observatory (SOHO), a joint NASA/ESA Spacecraft launched in November 1995. It is designed to perform ultraviolet spectroscopy and visible light polarimetry of the extended solar corona. The primary scientific objectives of the UVCS investigation are to study the physical processes occurring in the extended solar corona, such as: the mechanism of acceleration of the solar wind, the mechanism of coronal plasma heating, the identification of solar wind sources, and the investigation of the plasma properties of the solar wind. The UVCS End-to-End test activities included a comprehensive set of system level functional and optical tests. Although performed under severe schedule constraints, the End-to-End System Test was very successful and served to fully validate the UVCS optical design. All test results showed that the primary scientific objectives of the UVCS Mission were achievable.
Author
Heliosphere; Coronagraphs; Solar Corona; Plasma Heating; SOHO Mission; Solar Wind; Ultraviolet Spectroscopy

19970020029 Army Research Lab., Battlefield Environment Directorate, White Sands Missle Range, NM USA
Temporal Behavior of Natural Terrain Radiance at Infrared Wavelengths ***Final Report***
Bleiweiss, Max P., Army Research Lab., USA; Padilla, Christopher D., Army Research Lab., USA; Dec. 1996; 85p; In English
Report No.(s): AD-A320256; ARL-TR-1017; No Copyright; Avail: CASI; A05, Hardcopy; A01, microfiche

Because most infrared observation of natural terrain are made at infrequent or widely spaced time intervals, there is little information on the high time resolution variation in background radiance. This is in spite of the fact that meteorological and other influences can cause apparent radiance to change by amounts equivalent to a few degrees Kelvin in seconds or tens of seconds. Infrared imagery acquired during the recent Smart Weapons Operability Enhancement Joint Test and Evaluation allows the investigation of the nature of IR radiance fluctuations with high time resolution under a variety of dirunal and meteorological conditions. During the Grayling IR deployment, images were acquired at a rate of 6.25 frames per second, for 10 s every five min during each of the 2 h mission periods. There were 107 mission periods during the 41-day test. A portion of these images have been segmented according to homogeneous features (determined independently of the image content) and histograms of apparent temperature within those features have been processed to allow studies of the temporal variation of radiance. The nature of the fluctuations as a function of meteorological, atmospheric, and diurnal conditions is discussed; however, the result of this study is that the range of variation within the 10 s period, for the missions studied, is very small. The largest range observed for any of the ROIs was 1 K.
DTIC
Temporal Resolution; Meteorology; Infrared Spectra; Infrared Radiation; Infrared Imagery; Diurnal Variations

19970020052 Department of the Navy, Washington, DC USA
Process for Making Optical Fibers from Core and Cladding Glass Rods
Sanghera, Jasbinder, Inventor, Department of the Navy, USA; Pureza, Pablo, Inventor, Department of the Navy, USA; Aggarwal, Ishwar, Inventor, Department of the Navy, USA; Mossadegh, Reza, Inventor, Department of the Navy, USA; Aug. 12, 1996; 26p; In English
Patent Info.: Filed 12 Aug. 1996; US-Patent-Appl-SN-695444
Report No.(s): AD-D018415; No Copyright; Avail: US Patent and Trademark Office, microfiche

A core/clad glass optical fiber is made by melting a core glass rod and a cladding glass rod in separate crucibles which are not concentric with respect to each other and the respective core and cladding glass melts passed out of contact with each other to a glass melt contacting zone proximate a fiber drawing orifice in which the cladding glass surrounds the core glass and a core/

clad glass fiber is drawn. This process enables the clad glass fiber to be drawn directly from core and cladding glass rods without the need for a preform or forming a melt from glass chards or chunks, thereby reducing the cost of producing the fiber and also producing a glass clad optical fiber of high purity and excellent concentricity. Chalcogenide glass fibers having a concentricity of 100% have been made.
DTIC
Development; Optical Fibers; Glass Fibers

19970020090 Army Research Lab., Adelphi, MD USA
High-Sensitivity Wideband Analog Fiber-Optic Link Based on Integrated Optical Modulators ***Final Report, 1 Jun. 1994 - 1 Jun. 1996***
Benwell, Bruce T., Army Research Lab., USA; Edmands, Daniel, InterScience, Inc., USA; Saravia, Eduardo, InterScience, Inc., USA; Jan. 1997; 33p; In English
Report No.(s): AD-A320333; ARL-TR-1188; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche
This report summarizes the design and testing of a 1O-GHz analog fiber optic link. The device is based on a state of the art, commercially available LiNbO3 electrooptic integrated Mach-Zehnder modulator. The performance of the integrated link, as well as each individual component, is characterized and documented.
DTIC
Fiber Optics; Light Modulators; Mach-Zehnder Interferometers; Integrated Optics; Photometers

19970020182 Department of the Navy, Washington, DC USA
Fiber Bragg Grating Interrogation System with Adaptive Calibration
Davis, Michael A., Inventor, Department of the Navy, USA; Kersey, Alan D., Inventor, Department of the Navy, USA; Bellemore, David G., Inventor, Department of the Navy, USA; Feb. 28, 1997; 30p; In English
Patent Info.: Filed 28 Feb. 1997; US-Patent-Appl-SN-810167
Report No.(s): AD-D018419; No Copyright; Avail: Abstract Only (Dept. of the Navy, Washington DC), microfiche
A system and method for providing accurate measurements of the reflected wavelengths from multiple strings of fiber Bragg grating (FBG) elements using a single scanning optical filter and an isolated duplicate reference string of FBG elements. A reference string of FBG elements permits precise long term wavelength determination of sensors by providing real time adaptive calibration adjustments to correct for any nonlinearities in the response of the single scanning optical filter.
DTIC
Bragg Angle; Scattering Cross Sections; Optical Filters

19970020183 Department of the Navy, Washington, DC USA
A system and method for determining the return wavelength of fiber Bragg grating sensors using optoelectronic processing of the returned signal with a digitally controlled scanning filter element
Davis, Michael A., Inventor, Department of the Navy, USA; Kersey, Alan D., Inventor, Department of the Navy, USA; Bellemore, David G., Inventor, Department of the Navy, USA; Feb. 28, 1997; 12p; In English
Patent Info.: Filed 28 Feb. 1997; US-Patent-Appl-SN-810165
Report No.(s): AD-D018420; No Copyright; Avail: Issuing Activity (Dept. of the Navy, Washington DC), microfiche
A system and method for determining the return wavelength of fiber Bragg grating sensors using optoelectronic processing of the returned signal with a digitally controlled scanning filter element.
DTIC
Bragg Angle; Diffraction Paths

19970020207 Optical Society of America, Washington, DC USA
Organization of the 1996 Diffractive Optics and Micro Optics Topical Meeting, Volume 5 ***Final Report***
Hennage, David W., Optical Society of America, USA; Sep. 13, 1996; 391p; In English; Diffractive Optics and Micro-Optics, 29 Apr. - 2 May 1996, Boston, MA, USA
Contract(s)/Grant(s): DAAH04-96-I-0435
Report No.(s): AD-A317009; ARO-35913.1-PH-CI; No Copyright; Avail: CASI; A17, Hardcopy; A04, microfiche

The Diffractive Optics and Micro Optics Topical Meeting brought together scientists and engineers of various backgrounds to discuss new developments in the various aspects of diffractive and refractive micro-optics. These included modeling and design, fabrication and replication technology, and applications and products.
DTIC
Diffractive Optics; Fabrication; Optical Equipment; Diffraction

19970020229 Duke Univ., Dept. of Physics, Durham, NC USA
Continuous Sources of Optical Coherence for Optical Processing ***Final Report, 1 Aug. 1993 - 31 Aug 1996***
Thomas, John E., Duke Univ., USA; Oct. 03, 1996; 10p; In English
Contract(s)/Grant(s): F49620-03-I-0448; AF Proj. 3484
Report No.(s): AD-A315721; AFOSR-96-0438TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche
A broad program to investigate the nonlinear optical properties of a new type of dense atomic medium has been undertaken. This medium consists of a dense, diverging supersonic atomic beam for which the Doppler broadening is nearly eliminated by means of a magnetic field gradient. Research has been focused on characterizing the coherent radiation of the medium when it is prepared by continuous spatially separated optical fields. Spatial, directional, and coherence properties of the coherent field, including its quantum noise, have been investigated.
DTIC
Nonlinear Optics; Quantum Electronics; Atomic Beams; Coherent Radiation; Optical Properties

19970020334 Honeywell, Inc., Honeywell Technology Center, Minneapolis, MN USA
Optoelectronic Technology Consortium ***Final Report, 1 Jul. 1992 - 30 Apr. 1995***
Hibbs-Brenner, Mary, Honeywell, Inc., USA; Apr. 23, 1996; 43p; In English
Contract(s)/Grant(s): MDA972-92-C-0071
Report No.(s): AD-A317131; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche
This report describes the results of Honeywell's effort under the Optoelectronic Technology Consortium project. The program involved a consortium of Honeywell, AT&T, IBM and Martin Marietta. The overall goal of the program was to develop parallel fiber optic data link component and packaging technology and to demonstrate a link possessing 32 channels, each operating a 500 Mbps for an aggregate data rate of 16 Gbps. Baseline and alternate technologies were investigated. Honeywell's effort included: (1) the development of AlGaAs waveguide based four element electro-optic modulator arrays as an alternate transmitter technology, (2) packaging technology required to couple single mode fiber to, and multimode fiber from, the modulator array, and (3) a polymer waveguide based board level interconnect demonstration included an expanded beam connector feasibility study. Partway through the program we added a task to develop a second source capability for the Vertical Cavity Surface Emitting laser (VCSEL) arrays. During the program we demonstrated multi-gigahertz bandwidth modulator arrays with a contrast ratio greater than 10dB, and a voltage-length product of approximately 5.5 V-cm. The packaging technique developed allowed one to maintain a 1 dB additional coupling loss over the 0 to +123 C temperature range. The polymer waveguide demonstration showed that 60 optical waveguide channels could be coupled from board to-board through a 3mm connector with a fraction of a millimeter board to board alignment tolerance. We also demonstrated the fabrication of VCSEL arrays using MOCVD as the epitaxial layer growth technology.
DTIC
Fiber Optics; Semiconductor Lasers; Light Modulators; Optical Waveguides; Epitaxy; Aluminum Gallium Arsenides; Electro-Optics; Fabrication; Laser Arrays; Metalorganic Chemical Vapor Deposition; Surface Emitting Lasers

19970020335 Air Force Inst. of Tech., National Air Intelligence Center, Wright-Patterson AFB, OH USA
Preliminary Research for the Active Thin Mirror
Zhige, Zeng, Academia Sinica, China; Ning, Ling, Academia Sinica, China; Xuejun, Rao, Academia Sinica, China; Qiangjiguang Yu Zizishu (High Power Laser and Particle Beams); Oct. 04, 1996; Volume 8, No. 1, pp. 88--94; Transl. into ENGLISH of Qiangjiguang Yu Zizishu (High Power Laser and Particle Beams) (China), v8 n1 p88-94, Feb 96; In English
Contract(s)/Grant(s): F3333657-88-D-2188
Report No.(s): AD-A316763; NAIC-ID(RS)T-0346-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche
In this paper the capabilities of the fitting aberration polynomials of two deformable mirrors which model active thin mirrors are calculated by using the finite element method, and fitting aberration experiments are introduced. The computation results and the experiment results agree very well.
DTIC
Finite Element Method; Mirrors

19970020336 Rochester Univ., EE Dept., NY USA

Ultrafast Broadband Photodetectors for High-Tc Superconductive Optoelectronics ***Final Report, 1 Sep. 1991 - 31 Aug. 1992***

Fauchet, Philippe M., Rochester Univ., USA; Sep. 12, 1996; 5p; In English

Contract(s)/Grant(s): DAAL03-91-G-0318

Report No.(s): AD-A316750; ARO-29184.2-PH; No Copyright; Avail: CASI; A01, Hardcopy; A01, microfiche

The femtosecond optical response of YBCO films has been determined by pump-probe experiments after excitation with ultrashort optical pulses generated by a copper vapor amplified colliding pulse modelocked dye laser. From the results we have obtained as a function of pump intensity, probe wavelength and sample temperature, we find that contrary to the usually accepted interpretation, the position of the Fermi level is not at 2 eV above the copper d-band in oxygen-rich samples (at room temperature) and that the low-temperature optical response is not consistent with the destruction of superconductivity through the destruction of a large density of Cooper pairs via an avalanche process, followed by the restoration of superconductivity on a time scale of several picoseconds. In addition, the laser writing technique has been developed and refined to fabricate simple microbridges in initially oxygen-rich YBCO films.

DTIC

Photometers; YBCO Superconductors; Electro-Optics; Dye Lasers; Laser Beams; Superconducting Films; Pulsed Lasers; Metal Vapors; Laser Mode Locking; Fabrication

19970020352 Arkansas Univ., Physics Dept., Fayetteville, AR USA

Photorefraction as a Diagnostic Tool for InP ***Final Report, 1 Aug. 1993 - 31 Jul. 1996***

Salano, Gregory J., Arkansas Univ., USA; Dec. 18, 1996; 11p; In English

Contract(s)/Grant(s): F49620-93-I-0456; AF Proj. 3484

Report No.(s): AD-A320190; AFOSR-TR-97-0005; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The phase shift between the intensity pattern and the index pattern in two-wave mixing experiments has been determined from measured values of photorefractive two-wave mixing gain and diffraction efficiency in a bulk InP:Fe crystal as a function of the total incident intensity. Remarkably, the phase shift varies from 0 to 180 degrees with a value of 90 degrees at the intensity for which the two-wave mixing gain peaks. Comparison between theory and experiment yields values for sample Fe(2+) and Fe(3+)connections at 6 x 10(exp 15)cu cm and 4.8 x 10(exp 16)/cu cm respectively.

DTIC

Indium Phosphides; Phase Shift; Crystals; Photorefractivity

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see90 Astrophysics.

19970019334 National Inst. for Fusion Science, Nagoya, Japan

Optimization of M=2 Stellarator

Nakajima, Noriyoshi, National Inst. for Fusion Science, Japan; Yokoyama, Masayuki, National Inst. for Fusion Science, Japan; Okamoto, Masao, National Inst. for Fusion Science, Japan; Nuehrenberg, Juergen, Max-Planck-Inst. fuer Plasmaphysik, Germany; Dec. 1996; ISSN 0915-633X; 26p; In English

Report No.(s): NIFS-470; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Quasi-axisymmetric stellarator (QAS) configurations are considered for improvement of high energy reflected particle confinement. A reference QAS configuration with the field period of M=2 has been obtained by the optimization of the shape of the confinement region. A wide operational regime, collisional (without net plasma current) and collisionless (with bootstrap current) equilibria, have been examined. The magnetic axis shift is rather large in collisional equilibrium in the reference QAS configuration. On the other hand, in collisionless equilibrium, the bootstrap current is evaluated self-consistently and its crucial role on reduction of magnetic axis shift is shown. The effects of important boundary harmonics on the magnetic configuration are considered, in particular, plasma boundary control has been investigated for reducing the Pfirsch-Schlueter current. Based on the plasma boundary control, we have obtained two QAS(-like) configurations with reduced magnetic axis shift. The basic properties for these two configurations are also explained.

Author

Stellarators; Plasma Control; Plasma Equilibrium; Collisionless Plasmas; Collisional Plasmas; Magnetic Field Configurations; Optimization

19970019545 National Inst. for Fusion Science, Nagoya, Japan

Active trajectory control for a heavy ion beam probe on the compact helical system

Fujisawa, A., National Inst. for Fusion Science, Japan; Iguchi, H., National Inst. for Fusion Science, Japan; Lee, S., National Inst. for Fusion Science, Japan; Crowley, T.P., Rensselaer Polytechnic Inst., USA; Hamada, Y., National Inst. for Fusion Science, Japan; Hidekuma, S., National Inst. for Fusion Science, Japan; Kojima, M., National Inst. for Fusion Science, Japan; May 1996; 30p; In English

Report No.(s): NIFS-415; DE97-711095; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

A 200 keV heavy ion beam probe (HIBP) on the Compact Helical System torsatron/heliotron uses a newly proposed method in order to control complicated beam trajectories in non-axisymmetrical devices. As a result, the HIBP has successfully measured potential profiles of the toroidal helical plasma. The article will describe the results of the potential profile measurements, together with the HIBP hardware system and procedures to realize the method.

DOE

Ion Beams; Heliotrons; Trajectory Control; Active Control; Plasma Potentials; Heavy Ions

19970019699 California Univ., Electronics Research Lab., Berkeley, CA USA

Waves in Plasma Sheaths and at Boundaries:Theory and Computer Experiments ***Annual Report, 1 Sep. 1995 - 31 Aug. 1996***

Birdsall, Charles K., California Univ., USA; Cooperberg, David, California Univ., USA; Oct. 1996; 8p; In English

Contract(s)/Grant(s): N00014-93-I-1389

Report No.(s): AD-A317596; Rept-442427-23133; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

Detailed understanding of sheath waves in metal bounded plasmas. Sheath waves are defined as surface waves which propagate along a plasma/sheath surface.

DTIC

Plasma Sheaths; Surface Waves; Plane Waves

19970019717 Kyoto Univ., Dept. of Engineering Science, Japan

Atomic States and Collisional Relaxation in Plasma Polarization Spectroscopy: Axially Symmetric Case

Fujimoto, Takashi, Kyoto Univ., Japan; Sahara, Hironori, Kyoto Univ., Japan; Csanak, George, Los Alamos National Lab., USA; Grabbe, Shon, Kansas State Univ., USA; Oct. 1996; ISSN 0915-6364; 34p; In English

Report No.(s): NIFS-DATA-38; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

An ensemble of atoms (or ions) is described in terms of the density matrix, and two quantities, population and alignment, are assigned to each atomic level for axially symmetric plasma environment. Collisional relaxation is treated semiclassically as transitions between vectors in the Liouville space and interpreted as elastic or inelastic transitions among the population and the alignment of the levels. A spatially anisotropic velocity distribution of perturbers is expanded in terms of Legendre polynomials, and rate coefficients are defined for the transitions. A set of rate equations is constructed for the system of populations and another set for that of alignments. In the case of an isotropic Maxwellian distribution of perturbers, the former reduces to the conventional collisional-radiative model describing the ionizing plasma component of populations. As an example, beryllium-like oxygen in an anisotropic plasma environment is treated by this method.

Author

Velocity Distribution; Anisotropy; Atomic Collisions; Polarization Characteristics; Plasma Radiation; Particle Collisions

19970019930 JAYCOR, McLean, VA USA

Research in Pulsed Power Plasma Physics, Volume 2 ***Final Report***

Swanekemp, Steve, JAYCOR, USA; Rose, David, JAYCOR, USA; Aug. 1996; 658p; In English

Contract(s)/Grant(s): N00014-93-C-2086

Report No.(s): AD-A319991; No Copyright; Avail: CASI; A99, Hardcopy; A06, microfiche

This report contains Volume 2, section 4 of Research in Pulsed Power Plasma Physics. Specific topics include: (1) Plasma source development, (2) Microsecond POS operation, (3) POS load coupling, and (4) The ZFX facility.

DTIC

Plasma Diagnostics; Plasma Accelerators; Pulsed Lasers; Magnetohydrodynamics; Plasmas (Physics)

19970019931 JAYCOR, McLean, VA USA

Research in Pulsed Power Plasma Physics, Volume 1 ***Final Report***

Swanekemp, Steve, JAYCOR, USA; Rose, David, JAYCOR, USA; Aug. 1996; 552p; In English

Contract(s)/Grant(s): N00014-93-C-2086
Report No.(s): AD-A319992; No Copyright; Avail: CASI; A24, Hardcopy; A04, microfiche

This final report covers work performed by JAYCOR under Contract N00014-93-C-2086 with the Pulsed-Power Branch of the Plasma Physics Division of the Naval Research Laboratory (NRL). The research was conducted on-site at NRL by JAYCOR personnel as part of NRL's research programs in support of light ion inertial confinement fusion for the Department of Energy, and advanced pulsed-power systems for Nuclear Weapons effects simulations (NWES) for the Defense Nuclear Agency (DNA), now the Defense Special Weapons Agency (DSWA). The tasks performed under this contract included work in several areas. The original statement of work included the following tasks: (1) investigate and optimize POS operation in the 1 microsecond conduction time regime; (2) study the use of other opening switch concepts for use in greater than 10 microsecond conduction time regime; (3) investigate the coupling of a ten microsecond time opening switch to a one microsecond opening switch; (4) investigate the optimization of coupling between the POS and a load; (5) develop plasma sources for use in inductive energy store applications; (6) develop and study techniques for the transport of light ion beams; and (7) and develop ion beam conditions appropriate for the various transport schemes (addressed in task 6). JAYCOR personnel provided skilled design and, in the case of small items, fabrication of experimental hardware used in various experiments performed during this contract period. During the course of this contract JAYCOR was directed by the COTR to discontinue work on tasks 2 and 3. Significant progress was made on the remaining tasks in the statement of work. The results of that work are described in this report.

DTIC

Ion Beams; Plasma Accelerators; Plasma Diagnostics; Pulsed Lasers; Electron Beams; Fabrication; Inertial Confinement Fusion

19970019957 General Atomics Co., San Diego, CA USA

Stable bootstrap-current driven equilibria for low aspect ratio tokamaks

Miller, R. L., General Atomics Co., USA; LinLiu, Y. R., General Atomics Co., USA; Turnbull, A. D., General Atomics Co., USA; Chan, V. S., General Atomics Co., USA; Pearlstein, L. D., Lawrence Livermore National Lab., USA; Sauter, O., Ecole Polytechnique Federale de Lausanne, Switzerland; Villard, L., Ecole Polytechnique Federale de Lausanne, Switzerland; Aug. 1996; 17p; In English; Theory of Fusion Plasmas, 26-31 Aug. 1996, Varenna, Italy

Contract(s)/Grant(s): DE-FG03-95ER-54309

Report No.(s): GA-A22433; CONF-9608156-1; DE96-015185; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Low aspect ratio tokamaks can potentially provide a high ratio of plasma pressure to magnetic pressure beta and high plasma current I at a modest size, ultimately leading to a high power density compact fusion power plant. For the concept to be economically feasible, bootstrap current must be a major component of the plasma current. A high value of the Troyon factor beta(sub N) and strong shaping are required to allow simultaneous operation at high beta and high bootstrap current fraction. Ideal magnetohydrodynamic stability of a range of equilibria at aspect ratio 1.4 is systematically explored by varying the pressure profile and shape. The pressure and current profiles are constrained in such a way as to assure complete bootstrap current alignment. Both beta(sub N) and beta are defined in terms of the vacuum toroidal field. Equilibria with beta(sub N) greater than or equal 8 and beta - 35% to 55% exist which are stable to n = infinity ballooning modes, and stable to n = 0, 1, 2, 3 kink modes with a conducting wall. The dependence of beta and beta(sub N) with respect to aspect ratio is also considered.

DOE

Magnetohydrodynamic Stability; Tokamak Devices; Toroidal Plasmas; Aspect Ratio; Plasma Currents; Plasma Equilibrium

19970020107 Science Research Lab., Inc., Somerville, MA USA

Improved Threat Correlation from Higher Fidelity X-Ray Sources on Saturn, *29 Sep. 1992 - 28 Mar. 1995*

Greene, Phillip, Science Research Lab., Inc., USA; Nov. 1996; 66p; In English; Original contains color plates

Contract(s)/Grant(s): DNA001-92-C-0104

Report No.(s): AD-A317693; SRL16-F-1995; DNA-TR-95-88; No Copyright; Avail: CASI; A04, Hardcopy; A01, microfiche

A summary of the development of a Metal Plasma Source (MPS) with proposed applications as the imploding PRS load on a high current z-pinch is presented. The load design is comprised of an array of Metal Vapor Vacuum Arc (MEVVA) sources which produce high density (about 5 x 10(exp 16) ions/cc) titanium plasmas as demonstrated by two independent diagnostics. The MEVVA array, which has much greater azimuthal uniformity than a wire array of comparable diameter, delivers an annular load with selectable total mass and average diameter over of useful range of values. Also presented is a design for a novel Nested Shell load which utilizes the MPS as the inner shell. This Nested Shell has the possibility of leading to higher density, higher temperature pinches than are presently achieved with standard loads.

DTIC

Metallic Plasmas; Metal Vapors; Titanium; Zeta Pinch

19970020228 Japan Atomic Energy Research Inst., Tokyo, Japan
Specialist's meeting on nuclear data for fusion reactors
Shibata, Keiichi, Editor, Japan Atomic Energy Research Inst., Japan; Oyama, Yukio, Editor, Japan Atomic Energy Research Inst., Japan; Mar. 1996; 191p; In English; 3rd, 29-30 Nov. 1995, Tokai, Japan
Report No.(s): JAERI-Conf-96-005; CONF-9511246; DE97-711188; No Copyright; Avail: CASI; A09, Hardcopy; A02, microfiche

This issue is the collection of the paper presented at the title meeting. The 18 of the presented papers are indexed individually.
DOE
Fusion Reactors; Nuclear Fusion

19970020405 Instituto Nacional de Pesaciais Espaciais, Sao Jose dos Campos, Brazil
Tokamak ETE Pulsing Electric System with Digital Control (Spherical Tokamak Experiment) ***Sistema Eletrico Pulsado com Controle Digital do Tokamak Ete (Experimento Tokamak Esferico)***
Barbosa, Luis Filipe de F. P. W., Instituto Tecnologico de Aeronautica, Brazil; delBosco, Edson, Instituto Nacional de Pesaciais Espaciais, Brazil; 1997; 130p; In Portuguese; Translated into English by Schreiber Translations
Report No.(s): INPE-6137-PRP/200; No Copyright; Avail: CASI; A07, Hardcopy; A02, microfiche

This research project comprises a brief background of the controlled thermonuclear fusion and how it can solve energetic problems. It also describes how the tokamak machine works and the production systems of the Tokamak ETE magnetic field are also shown. The Tokamak ETE is a small aspect ratio machine used to study plasma physics for the research of controlled thermonuclear fusion. This machine is being built at the Plasma Associated Laboratory at the National Institute for Space Research in Sao Jose dos Campos - Sao Paulo.
Author
Tokamak Devices; Digital Systems; Plasma Physics

76
SOLID-STATE PHYSICS

Includes superconductivity. For related information, see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

19970019493 Eidgenoessische Technische Hochschule, Lab. fuer Neutronenstreuung, Zurich, Switzerland
Investigation into magnetic correlations in cuprates by means of neutron scattering experiments ***Untersuchung magnetischer Korrelationen in Kupraten mit Hilfe von Neutronenstreuexperimenten***
Henggeler, W., Paul Scherrer Inst., Switzerland; 1996; 109p; In German
Report No.(s): LNS-186; DE97-608971; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

Cuprate materials containing rare earth ions were studied. The main experimental tools were inelastic and elastic neutron scattering techniques. Some (mu)SR, susceptibility and specific heat measurements were also performed. One aim was to learn more about the crystalline environment of the rare earth ions in these substances via the crystalline electric field (CEF) interaction. Furthermore, we investigated the correlations of the magnetic moments of these ions by a determination of the dispersion of the CEF excitations. The theory that is essential for the understanding of this work is outlined. The instruments with which the experiments were performed are presented. We show the measurements of the CEF excitations of Ho(3+) in Y(0.99)Ho(0.01)Ba2Cu3O(6+x). The Ho ions represent ideal local probes to examine changes of the charge distribution in the copper oxide planes upon doping with oxygen. to prevent any influence of the Ho-Ho exchange interaction on the CEF excitations we performed the experiments on substances containing only one percent of Ho. Our results show that for all the intermediately doped compounds the charge distribution is very inhomogeneous. For all the highly doped samples we observe a line asymmetry for which several possible origins are discussed. We examine the Pr(3+) CEF excitations in the Pr(2-x)Ce(x)CuO4(-delta) (0 less than or equal to x less than or equal to 0.2)-substances. Our results show a coexistence of different environments of the Pr ions in all the doped compounds. We try to describe these inhomogeneities with the help of a model. We used the (mu)SR-technique on some of these samples in order to learn more about the oxygen reduction process. Finally, we performed inelastic neutron scattering experiments on Pr(1.86)Ce(0.14)CuO4 single crystal, which allowed a direct determination of the coupling constants between the magnetic moments of the Pr ions.
DOE
Neutron Scattering; Rare Earth Elements; Metal Ions; Magnetic Moments; Doped Crystals; Elastic Scattering; Inelastic Scattering

19970019505 North Carolina State Univ., Raleigh, NC USA

Interface Properties of Wide Bandgap Semiconductor Structures ***Annual Report, 1 Jul. - 31 Dec. 96,***

Davis, R. F., North Carolina State Univ., USA; Bedair, S., North Carolina State Univ., USA; Bernholc, J., North Carolina State Univ., USA; Nemanich, R. J., North Carolina State Univ., USA; Sitar, Z., North Carolina State Univ., USA; Dec. 1996; 102p; In English

Contract(s)/Grant(s): N00014-92-J-1477

Report No.(s): AD-A320478; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

Doping of GaN was achieved with doping levels of 5E16 - 3E18 /sq cm. Growth of GaN in H2 and N2 was accomplished with the two main differences being stronger PL intensity and slower growth rate for the films grown in N2. Biaxial strains resulting from mismatches in thermal expansion coefficients and lattice parameters in 22 GaN films grown on AlN buffer layers previously deposited on vicinal and on-axis 6H-SiC(000 1) substrates were measured via changes in the c-axis lattice parameter. A Poisson's ratio of n=0.18 was calculated. The shift in the bound exciton energy with film stress was 23 meV/GPa. As-deposited Pt contacts on Mg-doped, p-type GaN showed ohmic behavior with rc = 0-46 W.cu cm. Values of rc increased upon annealing to a maximum of 8.11x10(exp 3) W.cu cm at 700 C due to significant intermixing of Pt, Ga, N, and Mg, as revealed by SIMS analysis. As-deposited, 50 and 100 micrometers dia. Pt Schottky contacts on Si-doped, n-type GaN possessed barrier heights of 1.36 and 1.28 eV, respectively. The ideality factor for both diameters was 1.13. Leakage currents less than -1 nA at -10V reverse bias were achieved. A new Inductively Coupled Plasma (ICP) system has been designed, fabricated and initially tested. Parametric studies involving process gas flow rates, ICP and RF bias power and pressure to optimize the system for fast etch rates with the least surface damage/contamination are ongoing. Films of GaN were ion implanted with Si, Mg and Ca/P at energies of 160 keV (Si), 120 keV (Mg), and 180 KeV/130 KeV (Ca/P). The dose varied from 1E14 /sq cm to 1E15 /sq cm for Si and Mg and from 5E14 /sq cm to 5E15 /sq cm for Ca/P. Samples were implanted at 25 C (RT) and 550 C. Electrical activation has not been observed after repeated annealing. Analysis via RBS showed little or no damage compared to a virgin sample; however no PL spectra were observed in the implanted samples.

DTIC

Semiconductor Devices; Interfaces

19970019509 Wisconsin Univ., Dept. of Physics, Madison, WI USA

Gas Phase Reactions for the CVD of Diamond Films ***Final Report, 1 Jun. 1993 - 30 May 1996***

Lawler, J. E., Wisconsin Univ., USA; Anderson, L. W., Wisconsin Univ., USA; Oct. 1996; 8p; In English

Contract(s)/Grant(s): DAAH04-93-G-0260

Report No.(s): AD-A317158; ARO-31164-14-PH; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

The study of the gas phase chemical and physical reactions that occur in the Chemical Vapor Deposition (CVD) of diamond was the goal of ARO grants DAAH04-93-G-0260 and DAAH04-93-0185. We have developed an ultra-sensitive white light absorption spectroscopy technique and have used it together with absorption spectroscopy at the SRC synchrotron to determine the density of CH4, CH3, CH2, CH, C, and C2H2 and the dissociation fraction (H)/(H2)in various CVD reactors under diamond growth conditions. We have developed models to understand the gas phase reactions. We have found for different input gases with the same carbon fraction that the CH3 and CH densities are nearly the same in a microwave CVD reactor. Gas phase reactions rapidly scramble the system. We have also found that the (H)/(H2) ratio is determined by the dissociation fraction at the filament and that the C, CH, CH2, CH3 and CH4 species are in equilibrium at the (H)/(H2) ratio and the temperature. We have developed methods to measure the gas phase temperature in CVD reactors.

DTIC

Chemical Reactions; Vapor Phases; Diamond Films; Vapor Deposition

19970019527 Georgia Univ., Dept. of Chemistry, Athens, GA USA

Se Addlattices formed on Au(100): Studies by LEED, AES, STM and Electrochemistry, ***1 Jun. 1995 - 15 Oct. 1996***

Huang, Baoming M., Georgia Univ., USA; Lister, Tedd E., Georgia Univ., USA; Stickney, John L., Georgia Univ., USA; Oct. 15, 1996; 47p; In English

Contract(s)/Grant(s): N00014-91-J-1919

Report No.(s): AD-A317314; TR-25; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Ordered selenium atomic layers have been formed electrochemically on Au(100) at a series of coverages. Cyclic voltammetry and coulometry were used to study the deposition process, and to determine the corresponding coverages of a number of Se structures. Structures, with Se coverages of 1/4, 1/3, 1/2, and 8/9 monolayers (ML), were identified using ultra high vacuum - electrochemical (UHV-EC) techniques as well as scanning tunneling microscopy (STM). The corresponding unit cells of those structures were: p(2x2), (2X(radical-10)), c(2X2), and mostly (3X(radical-10)), composed of close-packed Se(8) rings. Pit formation, asso-

ciated with formation of the densely packed Se8 ring structure, was observed, and is reminiscent of pits observed in self assembly monolayers (SAMs) of alkane thiols on Au surfaces. The pits disappeared as the structure composed of Se rings, was converted to lower coverage structures, such as the 1/4 ML p(2X2), via anodic stripping. Se atomic layers were formed electro-chemically in three ways: direct reduction from a HSeO3 solution, anodic stripping of previously formed bulk Se, or cathodic stripping of previously formed bulk Se. All three methods resulted in equivalent atomic layer structures on the Au(100) surface, but with some variation in the homogeneity and distribution of particular structures.
DTIC
Atomic Structure; Crystal Lattices; Electrochemistry; Selenium; Electrodeposition; Coulometry; Volumetric Analysis

19970019583 Brookhaven National Lab., Dept. of Applied Science, Upton, NY USA
Crystallographic texture determinations from inverse susceptibility measurements
Lewis, L. H., Brookhaven National Lab., USA; Welch, D. O., Brookhaven National Lab., USA; 1996; 17p; In English; Magnetism and Magnetic Materials, 12-15 Nov. 1996, Atlanta, GA, USA
Contract(s)/Grant(s): DE-AC02-76CH-00016
Report No.(s): BNL-63416; CONF-961141-3; DE97-000141; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Determination of the quantitative relationship between crystallographic texture and magnetic properties in advanced permanent magnets may be hampered by complex microstructures, which complicate methods that rely on diffraction, or by interparticulate interactions, which adversely affect methods based on magnetic remanence measurements. to this end, new techniques in the determination of texture of bulk permanent magnets are being explored to overcome these inherent experimental difficulties. The analysis of inverse paramagnetic susceptibility measurements constitutes a new method to investigate crystallographic texture. Such measurements also provide Curie temperature data, which is sensitive to chemical changes that may have occurred in the magnetic phase during processing. The mathematical formalism underlying the analysis of inverse susceptibility measurements is outlined, and is used to evaluate magnetic measurements taken from a series of Nd2Fe14B magnets that have been processed by different means, and thus contain different degrees of texture. While this method does provide qualitative information concerning the relative crystallographic alignment of magnet samples, it needs calibration to obtain an explicit value for a texture order parameter.
DOE
Textures; Magnetic Measurement; Magnetic Materials; Paramagnetism; Curie-Weiss Law; Magnetic Permeability

19970019642 NASA Lewis Research Center, Cleveland, OH USA
Dopant Incorporation Efficiency in CVD Silicon Carbide Epilayers
Larkin, D. J., NASA Lewis Research Center, USA; Mat. Res. Soc. Symp. Proc.; 1996; Volume 410, pp. 337-344; In English
Report No.(s): NASA-TM-112756; NAS 1.15:112756; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, microfiche

In order to ensure reproducible and reliable SiC semiconductor device characteristics, controlled dopant incorporation must be accomplished. Some of the many factors which greatly influence dopant incorporation are the site-competition effect, SiC(0001) substrate polarity, substrate temperature, and the dopant-source reactor concentration. In this paper, dopant incorporation is considered and compared for various dopants in the context of dopant incorporation efficiency. by using secondary ion mass spectrometry (SIMS), the relative dopant incorporation efficiencies were calculated by dividing the SIMS determined dopant concentration in the resulting epitaxial layer by the intentional gas phase dopant concentration used during the SiC CVD. Specifically, the relative magnitudes of dopant incorporation efficiencies for nitrogen, phosphorus, and boron in 6H-SiC (0001) Si-face epitaxial layers are compared as a function of the site-competition effect and the dopant-source reactor concentrations. This serves as a first approximation for comparison of the relative 'doping potencies' of some common dopants used in SiC CVD epitaxial growth.
Author
Vapor Deposition; Silicon Carbides; Epitaxy; Additives

19970019688 Varian Associates, Palo Alto, CA USA
Trilayer Josephson junctions produced by atomic layer-by-layer FORCE (Flexible Oxide Reaction Controlled Epitaxy) *Final Report*
Sep. 30, 1995; 11p; In English; Limited reproducibility: More than 20% of this document may be affected by microfche quality
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): LLNL-97001068; DE97-001068; No Copyright; Avail: Issuing Activity (Department of Energy (DOE)), microfiche

Lawrence Livermore National Laboratory is working with Varian Associates to lay the groundwork for the routine, reproducible fabrication of high-temperature superconducting trilayer structures. The objectives of this program are: to identify high temperature, superconducting materials, metallic and insulating barrier materials and associated substrate and electrode materials for engineered trilayer structures that can provide Josephson Junction devices with desired characteristics for sensor or electronic circuit use. To identify and test potentially useful analysis techniques and to provide data appropriate for the validation and analysis of the input materials, trilayer structures and completed JJ devices. to integrate the analysis results with the existing Varian data base to optimize the growth and fabrication process to obtain more reproducible devices across each chip and from chip to chip. These objectives were defined by a detailed set of milestones for both Lawrence Livermore National Laboratory and Varian Associates all of which have been meet. The timing of the milestones was revised midway through the CRADA term to allow a longer time to pursue the objectives at no additional cost to either partner.
DOE
Superconductors (Materials); Refractory Materials; Josephson Junctions; High Temperature Superconductors; Electrode Materials; Circuits

19970019732 Universite Catholique de Louvain, Microelectronics Lab., Belgium
Research into the Behavior of SOI Devices Operating in Extreme Environments ***Final Report, 16 Sep. 1995 - 15 Sep. 1996***
Colinge, J. P., Universite Catholique de Louvain, Belgium; Chen, J., Universite Catholique de Louvain, Belgium; Francis, P., Universite Catholique de Louvain, Belgium; Vandooren, A., Universite Catholique de Louvain, Belgium; Eggermont, J. P., Universite Catholique de Louvain, Belgium; Sep. 1996; 50p; In English
Contract(s)/Grant(s): F61708-94-C-0010
Report No.(s): AD-A317750; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche
This report describes: (1) results of irradiation of GAA/SOI analog circuits, (2) quantum effects in GAA transistors, (3) high temperature operation of SOI magnetic sensors, (4) tungsten metallization on SOI devices, and (5) quantum wires made in SOI.
DTIC
Metal Oxide Semiconductors; Quantum Electronics; SOI (Semiconductors)

19970019909 Oslo Univ., Dept. of Physics, Norway
Measurements and characterization of a hole trap in neutron-irradiated silicon
Avset, Berit Sundby, Oslo Univ., Norway; Apr. 1996; ISSN 0332-5571; 44p; In English
Report No.(s): OUP-96-07; DE97-610200; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche
The report describes measurements on a hole trap in neutron irradiated silicon diodes made one high resistivity phosphorus doped float-zone silicon. The hole trap was detected by Deep Level Transient Spectroscopy. This measurement gave a trap activation energy of 0.475 MeV. Other measurements showed that the trap has very small capture cross sections for both holes and electrons (10(exp -18) to 10(exp -20) cm(exp 2)) and that the hole capture cross section is temperature dependent. The energy level position of the trap has been estimated to be between 0.25 and 0.29 eV from the valence band.
DOE
Absorption Cross Sections; Activation Energy; Doped Crystals; Electrical Resistivity; Energy Levels; Float Zones; Irradiation; Neutrons; Phosphorus

19970019925 NASA Lewis Research Center, Cleveland, OH USA
YBCO High-Temperature Superconducting Filters on M-Plane Sapphire Substrates
Sabataitis, J. C., Case Western Reserve Univ., USA; Mueller, C. H., NASA Lewis Research Center, USA; Miranda, F. A., NASA Lewis Research Center, USA; Warner, J., NASA Lewis Research Center, USA; Bhasin, K. B., NASA Lewis Research Center, USA; Advances in Cryogenic Engineering; 1996; Volume 41, pp. 1755-1760; In English
Report No.(s): NASA-TM-112755; NAS 1.15:112755; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche
Since the discovery of High Temperature Superconductors (HTS) in 1986, microwave circuits have been demonstrated using HTS films on various substrates. These HTS-based circuits have proven to operate with less power loss than their metallic film counterparts at 77 K. This translates into smaller and lighter microwave circuits for space communication systems such as multiplexer filter banks. High quality HTS films have conventionally been deposited on lanthanum aluminate (LaAlO3) substrates. However, LaAlO3 has a relative dielectric constant (epsilon(sub r)) of 24. With a epsilon(sub r) approx. 9.4-11.6, sapphire (Al2O3) would be a preferable substrate for the fabrication of HTS-based components since the lower dielectric constant would permit wider microstrip lines to be used in filter design, since the lower dielectric constant would permit wider microstrip lines to be used for a given characteristic impedance (Z(sub 0)), thus lowering the insertion losses and increasing the power handling capabilities of the devices. We report on the fabrication and characterization of YBa2Cu3O(7-delta) (YBCO) on M-plane sapphire

bandpass filters at 4.0 GHz. For a YBCO 'hairpin' filter, a minimum insertion loss of 0.5 dB was measured at 77 K as compared with 1.4 dB for its gold counterpart. In an 'edge-coupled' configuration, the insertion loss went down from 0.9 dB for the gold film to 0.8 dB for the YBCO film at the same temperature.
Author
YBCO Superconductors; Sapphire; Microwave Circuits; Space Communication; Permittivity; Bandpass Filters; Insertion Loss

19970020023 Illinois Univ., Dept. of Electrical and Computer Engineering, Urbana, IL USA
Gross-Sectional Scanning/Tunneling Microscopy Investigations of Cleaned III-V Heterostructures ***Final Report, 1 Jul. 1993 - 30 Sep. 1996***
Wu, Warren, Illinois Univ., USA; Dec. 16, 1996; 7p; In English
Contract(s)/Grant(s): F49620-93-I-0443
Report No.(s): AD-A319318; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

Fabrication technology and device sizes have reached the point where fluctuations on the atomic level may affect device performance. The need for a tool to characterize these structures has been satisfied by cross-sectional scanning tunneling microscopy (XSTM). This summary and attached thesis detail the development and application of XSTM to III-V heterostructures accomplished during the term of the JSEP Fellowship of Warren Wu. An ultra-high vacuum (UHV) system dedicated to XSTM was specifically designed and constructed as part of this work. Reported for the first time were XSTM cross sections of self assembled InAs quantum dots, XSTM cross sections of quantum wires created by the strain induced lateral layer ordering (SILO) process as well as the first XSTM data on working device structures. These working device structures include resonant tunneling diode (RTD) structures, a quantum well infrared photodetector structure and a modulation doped field effect transistor (MODFET) structure. XSTM has proved useful in characterizing interface roughness, alloy fluctuations and individual atomic positions.
DTIC
Scanning Tunneling Microscopy; Heterojunctions; Doped Crystals; Resonant Tunneling; Modfets; Quantum Wells; Fabrication

19970020078 North Carolina State Univ., Raleigh, NC USA
Growth, Characterization and Device Development in Monocrystalline Diamond Films ***Quarterly Report, 1 Oct. - 31 Dec. 1996***
Davis, R. F., North Carolina State Univ., USA; Nemanich, R. J., North Carolina State Univ., USA; Sitar, Z., North Carolina State Univ., USA; Baumann, P. K., North Carolina State Univ., USA; Bozeman, S. P., North Carolina State Univ., USA; Dec. 31, 1996; 20p; In English
Contract(s)/Grant(s): N00014-93-I-0437
Report No.(s): AD-A319920; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The electron affinity and Schottky barrier height of thin Cu and Zr films on diamond(100) substrates, cleaned at 500 or 1150 Celsius in UHV and terminated with oxygen or free of chemisorbed species, respectively, were correlated by means of UV photoemission spectroscopy. The achievement of NEA was dependent on the surface preparation before metal deposition and on the metal work function. The Schottky barrier height for clean surfaces was lower than those terminated by oxygen; the former exhibited an NEA. In all field emission measurements, a reduction in the threshold electric field was observed upon metal overgrowth. Free-standing, 4 mm diameter highly-textured (100) diamond membranes were obtained by coupling bias enhanced nucleation in a microwave plasma CVD reactor with an evolutionary texture selection growth process in a low pressure combustion flame reactor and subsequent etching of the Si substrate. High energy particle detectors were fabricated via patterning of microstrip electrodes on these membranes. These detectors were used to measure the energy spectra of a-particles at the Continuous Electron Beam Accelerator Facility and to determine the spatial resolution of these particles. The performance was similar to those obtained by monocrystalline detectors.
DTIC
Diamond Films; Negative Electron Affinity; Electron Beams; Fabrication; Crystal Growth; Nucleation; Single Crystals; Vapor Deposition; Radiation Counters

19970020122 New Mexico Univ., Center for High Technology Materials, Albuquerque, NM USA
Tailored Group Velocity Dispersion Using Periodic Structures ***Final Report, 1 Aug. 1993 - 31 Jul. 1996***
Agi, Kamil, New Mexico Univ., USA; Malloy, Kevin J., New Mexico Univ., USA; Aug. 26, 1996; 77p; In English
Contract(s)/Grant(s): F49620-93-I-0447; AF Proj. 3484
Report No.(s): AD-A319787; AFOSR-TR-96-0585; No Copyright; Avail: CASI; A05, Hardcopy; A01, microfiche

Photonic crystals are three- or lower-dimensional dielectric structure that exhibits overlapping stop bands in all directions. The focus of this work has been the design and characterization of a novel face-centered-cubic photonic crystal. The characteriza-

tion was done in four parts. The first was a simple microwave network analyzer measurement where horn antennas were used transmit and receive Continuous Waves (CW) microwave radiation. The second characterization was a direct time-domain characterization using photoconductively switched planar antennas to generate and detect short bursts of electromagnetic radiation. The third method of characterization was the high-power microwave characterization where the Sinus-6 was used as the source to generate high peak power pulses. The final characterization done was the use of infra-red thermal imaging to study the distribution of the scattered signal from a photonic crystal. Furthermore, the infrared thermal imaging was used to study the localized heating of the crystal due to high average power continuous wave excitation. Finally various applications of the three-dimensional photonic crystal emerged such as a Ultra Wide Band (UWB) photonic crystal and photonic crystals as quasi-optical component for high-power microwave systems. This work lead to a number of ongoing collaborations including collaborations with Air Force Phillips Laboratory and MIT Lincoln Laboratory.
DTIC
Dielectrics; Optical Properties; Crystal Structure; Continuous Radiation

19970020123 Illinois Univ., Dept. of Electrical and Computer Engineering, Urbana, IL USA
Gross-Sectional Scanning/Tunneling Microscopy Investigations of Cleaned III-V Heterostructures ***Final Report, 1 Jul. 1993 - 31 Jul. 1996***
Wu, Warren, Illinois Univ., USA; Dec. 16, 1996; 7p; In English
Contract(s)/Grant(s): F49620-93-I-0443; AF Proj. 2305
Report No.(s): AD-A319819; AFOSR-TR-97-0004; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

Fabrication technology and device sizes have reached the point where fluctuations on the atomic level may affect device performance. The need for a tool to characterize these structures has been satisfied by Cross-Sectional Scanning Tunneling Microscopy (XSTM). This summary and attached thesis detail the development and application of XSTM to III-V heterostructures accomplished during the term of the JSEP Fellowship of Warren Wu. An Ultra-High Vacuum (UHV) system dedicated to XSTM was specifically designed and constructed as part of this work. Reported for the first time were XSTM cross-sections of self-assembled InAs quantum dots, XSTM cross-sections of quantum wires created by the Strain-Induced Lateral-Layer Ordering (SILO) process as well as the first XSTM data on working device structures. These working device structures include Resonant Tunneling Diode (RTD) structures, a quantum well infrared photodetector structure and a Modulation Doped Field Effect Transistor (MODFET) structure. XSTM has proved useful in characterizing interface roughness, alloy fluctuations and individual atomic positions.
DTIC
Scanning Tunneling Microscopy; Modfets; Product Development; Quantum Electronics

19970020124 Emory Univ., Dept. of Physics, Atlanta, GA USA
International Symposium on Growth and Optical Properties of Compound Semiconductors III-VI and II-VI ***Final Report, 30 Oct. 1995 - 29 Oct. 1996***
Oct. 29, 1996; 62p; In English, 13-14 Nov. 1995, Dayton, OH, USA
Contract(s)/Grant(s): F49620-96-I-0015; AF Proj. 2305
Report No.(s): AD-A319822; AFOSR-TR-97-0002; No Copyright; Avail: CASI; A04, Hardcopy; A01, microfiche

The purpose of this symposium was to provide a forum for the discussion of recent developments in the growth and optical studies of III-V and II-VI semiconductors and their heterostructures. Both experimental and theoretical progress in the areas of synthesis, optical characterization and device applications was reviewed by an international panel of distinguished scientists. The future directions of research were discussed. The emergence of enormous interest in the study of wide-bandgap semiconducting systems in recent years and rapid progress made in this area were among the highlights of this symposium. The Symposium was attended by about seventy scientists from U.S., Japan, Germany and France.
DTIC
Conferences; Semiconductor Devices; Optical Properties; Heterojunctions

19970020125 Montana State Univ., Dept. of Physics, Bozeman, MT USA
Spectroscopy of Materials for Persistent Spectral Hole Burning Optical Memories and Signal Processing ***Final Report, 1 Sep. 1995 - 31 Dec. 1996***
Cone, Rufus L., Montana State Univ., USA; Dec. 31, 1996; 10p; In English
Contract(s)/Grant(s): F49620-95-I-0504; AF Proj. 3484
Report No.(s): AD-A319824; DURIP-95; AFOSR-TR-97-0003; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

The search for new optical materials for spectral hole burning applications, evaluation of their dynamic and static properties, and studies of the ultimate limits on material performance consistent the research that was carried out. We strive to understand the atomic scale mechanisms that determine material performance. Attention is focused on rare earth and transition metal ion materials; systems for photon gated hole burning are explored. General facilities for hole burning research are available in our laboratory, and we have fifteen years experience in this area, studying a variety of rare earth activated materials.
DTIC
Spectroscopy; Optical Data Processing; Signal Processing; Optical Memory (Data Storage); Semiconductor Devices

19970020209 Aachener Centrum fuer Erstarrung unter Schwerelosigkeit e.V., Germany
Melt processing of bulk YBaCuO superconductors ***Herstellung texturierter Hochtemperatursupraleiter - Massivmaterialien durch Schmelzverfahren. Schlussbericht***
Schmitz, G.J., Aachener Centrum fuer Erstarrung unter Schwerelosigkeit e.V., Germany; 1996; 30p; In German
Contract(s)/Grant(s): BMBF 13N556A
Report No.(s): INIS-mf-15174; DE96-770898; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche; US Sales Only; US Sales Only

Mechanisms of phase formation occuring during the preparation of the YBa(sub 2)Cu(sub 3)O(7-x) superconductor from the melt have been investigated. Objective of this work was a better understanding of the processes and an accordingly improved control of the processes and the resulting properties. Within the project it could be shown that: 1. Primary nucleation of the superconducting YBa2Cu3O(7-x) phase from the undercooled melt is possible and in principe enables higher growth rates 2. Growth of the superconducting phase is diffusioncontrolled and accordingly is strongly influenced by the distribution of the Y2BaCuO5 phase in the melt. A intentionally controlled distribution of this phase e.g. in reactive processes will therefore allow for a better control of microstructure formation as achieved by now using thermal gradients. 3. Nucleation is an important factor in YBa2Cu3O(7-x) growth as could be shown when using NdBa2Lu3O(7x) seeds (in cooperation with Argonne National Lab, USA) to grow large domains. Investigations on controlled seeding as well as on grain selection mechanisms in competitive growth will become important in the future. All investigations were accompanied by numerical simulations based on the phase field concept.
DOE
Superconductors (Materials); Melts (Crystal Growth); Melting

19970020302 Oak Ridge National Lab., TN USA
Magnetism in BaCoS2
Mandrus, D., Oak Ridge National Lab., USA; Chakoumakos, B.C., Oak Ridge National Lab., USA; Fernandez-Baca, J.A., Oak Ridge National Lab., USA; Nagler, S.E., Oak Ridge National Lab., USA; Sales, B.C., Oak Ridge National Lab., USA; Sarrao, J.L., Florida State Univ., USA; Aug. 1996; 15p; In English; Magnetism and Magnetic Materials '96, 12 - 15 Nov. 1996, Atlanta, GA, USA
Contract(s)/Grant(s): DE-AC05-96OR-22464; DMR-9016241
Report No.(s): CONF-961141-1; DE96-015024; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

BaCoS2 is a layered Mott-Hubbard insulator that orders antiferromagnetically near 300 K. We report magnetic susceptibility measurements on polycrystalline BaCoS2 from 77 K to 800 K, and in- and out-of-plane measurements on single crystals from 2 K to 350 K. We also report a powder neutron refinement of the magnetic structure of BaCoS2. The neutron measurements indicate that the moments lie in the plane, and that the magnetic unit cell is the same as the (orthorhombic) chemical cell. The ordered moment obtained from the neutron refinement is close to 3 mu(sub B) indicating that the Co ions are in the high-spin (S = 3/2) configuration. The effective moment inferred from the high temperature susceptibility, p = 5.26 mu(sub B) is also consistent with high-spin Co(2+).
DOE
Barium Compounds; Sulfur Compounds; Cobalt Compounds; Spin; Antiferromagnetism; Magnetic Permeability; Polycrystals

77
THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also 25 Inorganic and Physical Chemistry and 34 Fluid Mechanics and Heat Transfer.

19970019554 Dayton Univ., OH USA
Tri-Service Thermal Radiation Test Facility: Quartz High Density Lamp Bank and Computer Data Acquisition Operators

Manual, *26 Oct. 1991 - 17 Jul. 1994*
Sweeney, Michael, Dayton Univ., USA; Dec. 1996; 41p; In English
Contract(s)/Grant(s): DNA001-90-C-0081
Report No.(s): AD-A319006; UDR-TR-94-37; DNA-TR-96-32; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Safe operational and servicing test procedures for the Quartz Lamp Bank and Windtunnel, and the Mobile Quartz Lamp Bank are describe d in this document. The manual guides test technicians, operating a Grid 486 microprocessor, in using proper safety and operational procedures in the operation, control and data acquisition of the Quartz Lamp and Windtunnel systems. A safety checklist to be followed prior to and during equipment utilization is provided. A description of instrumentation used in support of testing and procedures for servicing the test equipment is also provided.
DTIC
Thermal Radiation; Data Acquisition; Quartz Lamps

19970020071 Naval Postgraduate School, Dept. of Mechanical Engineering, Monterey, CA USA
Convective Heat Transfer from a Vertical Cylinder in a High Amplitude Resonant Sound Field
Bridenstine, Mark, Naval Postgraduate School, USA; Sep. 1996; 112p; In English
Report No.(s): AD-A320233; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

This thesis is part of a continuing study in developing convective heat transfer correlations for a cylinder in a high amplitude zero-mean oscillating flow. The experiment described here utilizes the RTD technique and a steady state heat transfer measurement method with a platinum wire, serving as the test section, positioned across the inner diameter of a cylindrical plexiglass chamber supporting a strong resonant axial acoustic field. Utilizing two different wire diameters of 0.050 mm and 0.127 mm, various pressure ratios, frequencies, and temperature differences, separated flow heat transfer correlations have been developed. This work would find application in the design of heat exchangers for a thermoacoustic engine.
DTIC
Convective Heat Transfer; Cylindrical Chambers; Heat Exchangers; Oscillating Flow; Separated Flow; Acoustics; Heat Engines; Temperature Gradients

80
SOCIAL SCIENCES (GENERAL)

Includes educational matters.

19970019559 Elizabeth City State Univ., NC USA
ONR AASERT Summer 1996 Research Teams *Quarterly Report, 24 Jun. - 2 Aug. 1996*
Hayden, Linda Bailey, Elizabeth City State Univ., USA; Jan. 1996; 61p; In English
Contract(s)/Grant(s): N00014-94-I-1089; N00014-94-I-0948
Report No.(s): AD-A317663; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), microfiche

The AASERT Summer Research Program is part of a trio of programs at ECSU funded by ONR. They include the parent grant Nurturing ECSU Research Talent (NERT), NERT-I(Instrumentation) and Augmentation Award for Science and engineering Research Training(AASERT). The AASERT grant provides funds or the summer component while NERT-I provides instrumentation for both NERT and AASERT. Student development activities have included the following: (a) Recruitment of high ability minority students; (b) Providing a summer program for recruited students; (c) Providing research experiences; (d) Providing a mentor, graduate school counseling and GRE preparation; (e) Providing financial support for students in the form of research assistantships; and (f) Providing funds for student travel. This report documents the summer research activities of the NERT and AASERT program.
DTIC
Software Engineering; Computer Networks; Information Transfer; Asynchronous Transfer Mode; Distributed Processing

19970020085 Dynamac Corp., Cocoa Beach, FL USA
NASA Kennedy Space Center Educator Workshops: Exploring Their Impact on Teacher Attitudes and Concerns, *Jun. 1994 - Dec. 1996*
Dreschel, Thomas W., Dynamac Corp., USA; Dec. 1996; 258p; In English
Report No.(s): NASA-TM-112241; NAS 1.15:112241; No Copyright; Avail: CASI; A12, Hardcopy; A03, microfiche

The National Aeronautics and Space Administration holds summer teacher workshops to motivate teachers to use space science in their lessons. In evaluating these workshops, the areas of interest were participant beliefs about science and science teach-

ing and concerns about educational change and innovation. The teachers attending workshops in 1995, past participants, teachers that received materials but had not attended a workshop, and science researchers were surveyed using the Beliefs about Science and Science Education Survey and/or the Stages of Concern Questionnaire. Comparisons were made by workshop length, time since workshop, and highest grade taught. Reductions in concerns were most evident in the four week workshop. Changes in beliefs were also observed relative to teaching approach and ability. Differences in beliefs were observed between teachers and science researchers. Differences were also observed relative to time since attendance and by grade level taught. It is recommended that the workshops be at least four weeks in length and in length and target specific grade levels, that refresher workshops be offered.
Author
NASA Programs; Education

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DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

19970019331 Massachusetts Univ., Amherst, MA USA
Browsing, Discovery and Search in Large Distributed Databases of Complex and Scanned Documents ***Topical Report, 1 Oct. - 31 Dec. 1996***
Croft, W. Bruce, Massachusetts Univ., USA; Jan. 15, 1997; 9p; In English
Contract(s)/Grant(s): F19628-95-C-0235; ARPA Order D468
Report No.(s): AD-A320022; TR-528181197; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

This project aims to integrate powerful, new techniques for interactive browsing, discovery, and retrieval in very large, distributed databases of complex and scanned documents. Emphasis is placed on going beyond full text retrieval techniques developed in the DARPA TIPSTER program to support different types of access and non-textual content. These techniques should be particularly relevant to the patent domain where it is important to find relationships between documents and where the patent or trademark may be based on a visual design. The specific tasks identified involve studying representation techniques for long documents with complex structure, browsing and discovery techniques for large text databases, image retrieval and scanned document retrieval techniques, and architectures for large, distributed databases.
DTIC
Information Retrieval; Data Retrieval; Data Bases; Computer Programs

19970019558 Department of Defense, Directorate for Information Operations and Reports, Washington, DC USA
Department of Defense Catalog of DIOR Reports
Oct. 1996; 14p; In English
Report No.(s): AD-A317664; DIOR/D01-97/01; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The Catalog of DIOR Reports summarizes publications produced by the Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (DoD/WHS/DIOR). Each summary includes the publication number, title, frequency, a brief description of the report's contents, estimated number of pages, and estimated date that the publication will be available.
DTIC
Catalogs (Publications); Manpower; Contracts

19970019746 Oak Ridge National Lab., TN USA
Packaging and distributing ecological data from multisite studies
Olson, R. J., Oak Ridge National Lab., USA; Voorhees, L. D., Oak Ridge National Lab., USA; Field, J. M., Oak Ridge National Lab., USA; Gentry, M. J., Oak Ridge National Lab., USA; 1996; 9p; In English; Eco-Informa, 4-7 Nov. 1996, Lake Buena Vista, FL, USA
Contract(s)/Grant(s): DE-AC05-96OR-22464; DOE-2013-F044-A1
Report No.(s): NASA-CR-204757; NAS 1.26:204757; CONF-961119-3; DE96-014667; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

Studies of global change and other regional issues depend on ecological data collected at multiple study areas or sites. An information system model is proposed for compiling diverse data from dispersed sources so that the data are consistent, complete,

and readily available. The model includes investigators who collect and analyze field measurements, science teams that synthesize data, a project information system that collates data, a data archive center that distributes data to secondary users, and a master data directory that provides broader searching opportunities. Special attention to format consistency is required, such as units of measure, spatial coordinates, dates, and notation for missing values. Often data may need to be enhanced by estimating missing values, aggregating to common temporal units, or adding other related data such as climatic and soils data. Full documentation, an efficient data distribution mechanism, and an equitable way to acknowledge the original source of data are also required.
DOE
Climatology; Consistency; Packaging; SOIls

19970019748 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Information Warfare: Librarians on the Frontline ***Final Report***
McConnell, Elaine, Editor, Army Command and General Staff Coll., USA; Brown, Stephen, Editor, Army Command and General Staff Coll., USA; Oct. 30, 1996; 202p; In English; 39th; Military Libraian, 9-12 Oct. 1995, Fort Leavenworth, KS, USA
Report No.(s): AD-A317738; No Copyright; Avail: CASI; A10, Hardcopy; A03, microfiche

The Thirty-Ninth Annual Military Librarians Workshop was held in Kansas City Missouri and Fort Leavenworth, Kansas, October 9-12 1995. The conference entitled 'Information Warfare: Librarians on the Frontline' was hosted by the Combined Arms Research Library. The focus was electronic and information security. Presentations included 'Copyrights and Electronic Media', the Army Knowledge Network, the JANUS training system. Librarians in the Information Age' and 'Information Warfare: Net-surfing and Military Secrets'.
DTIC
Libraries; Warfare; Security

19970019918 Naval Postgraduate School, Monterey, CA USA
Attacking the Infrastructure: Exploring Potential Uses of Offensive Information Warfare
Elam, Donald E., Naval Postgraduate School, USA; Jun. 1996; 216p; In English
Report No.(s): AD-A311391; No Copyright; Avail: CASI; A10, Hardcopy; A03, microfiche

The world has entered the Third Wave; it has entered the Information Age. One of the fundamentals of this paradigm shift is the fact that information is power. The side that controls information more effectively will be victorious. Thus, countries and militaries must change their mentality in order to survive. A new form of conflict, Information Warfare, has been born. This new discipline is large, dynamic, and complex. The need exists for education among military officers and other concerned professionals throughout the country. This thesis helps to bridge the education gap. It presents a snapshot of Information Warfare today, exploring many different avenues and possibilities along the way. The first half of the document is focused on Information Warfare in general, and the second half deals specifically with the offensive side. The purpose of this thesis is not to present an all-encompassing view of Offensive Information War or eve of Information Warfare in general. The field of Information Warfare is too big for any one individual or organization to fully comprehend all of its intricacies. Indeed, due to the dynamic nature of this discipline, chances are that some, or maybe even all, of the material contained herein will be obsolescent upon publication. The goal of the thesis is to present one view of Information Warfare, as seen through the eyes of many. The hope is that some benefit will be garnered by the reader, even if it only sparks an idea or helps to understand th importance of this growing warfare dimension.
DTIC
Warfare; Evasive Actions

19970020024 Wizdom Systems, Inc., Naperville, IL USA
FRAME/WORK: Human Issues in Information Technology Implementation ***Final Report, Oct. 1993 - Jul. 1995***
Batteau, Allen W., Wizdom Systems, Inc., USA; Jan. 1996; 113p; In English
Contract(s)/Grant(s): F41624-93-C-5016; AF Proj. 3005
Report No.(s): AD-A319358; AL/HR-TR-1995-0185; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

This report presents the results of 'FRAME/WORK, Human Issues in Information Technology'. The FRAME/WORK research investigated the cultural and contextual issues involved in the implementation of information technologies that create new forms of connectivity: e-mail, CAD, Electronic Data Interchange, workflow tools, shared databases, document imaging, and video teleconferencing. Based on this investigation, a readiness assessment tool was developed to assist SPO commanders and MIS support personnel in the implementation of these technologies in their organizations. The study used anthropological methods to assess work group and SPO culture and contextual variables, and develop an ecological model of the implementation of new technology as a form of adaptation. The findings of the study concern specific issues, such as organizational turbulence and frag-

mentation, security issues, and organizational structure that facilitate or inhibit the implementation of new information technology.
DTIC
Telecommunication; Information Systems; Social Factors; Technology Transfer

19970020077 San Diego Supercomputer Center, San Diego, CA USA
Intelligent Metacomputing Testbed (Distributed Object Computational Testbed (DOCT)) ***Quarterly Report, Oct. - Dec. 1996***
Bender, Dan, San Diego Supercomputer Center, USA; Moore, Reagan, San Diego Supercomputer Center, USA; Marciano, Richard, San Diego Supercomputer Center, USA; Genetti, Jon, San Diego Supercomputer Center, USA; Jan. 08, 1997; 48p; In English
Contract(s)/Grant(s): F19628-96-C-0020; ARPA Order D570
Report No.(s): AD-A319786; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The Distributed Object Computation Testbed (DOCT) has two principal goals: the demonstration of an object computation environment that supports distributed processing of large archived data sets and the demonstration of support for electronic submission and processing of complex documents and patent applications for the U.S. Patent and Trademark Office (USPTO). The infrastructure that is being integrated to create this testbed includes archival storage systems, databases, an object computation system, document management systems, and intelligent agents that support the patent application workflow. The resulting technologies should also apply to the information needs of other agencies, such as the National Science Foundation, the National Institutes of Health, the Nuclear Regulatory Commission, the Environmental Protection Agency (EPA), the Department of Energy, and the Department of Defense.
DTIC
Intelligence Tests; Distributed Processing; Data Management; Test Stands

19970020379 Naval Air Warfare Center, Saint Inigoes, MD USA
Metafile for Interactive Documents, Version 2.0: Application Guide and Draft Performance Specification for the Encoding of Interactive Documents ***Final Report***
Janiszewski, Darlene, Naval Air Warfare Center, USA; Anderson, Michael, Naval Air Warfare Center, USA; Bullard, Len, Naval Air Warfare Center, USA; Castelli, Terri, Naval Air Warfare Center, USA; Cooper, David, Naval Air Warfare Center, USA; Mar. 1996; 79p; In English; Limited Reproducibility: More than 20% of this document may by affected by microfiche quality
Report No.(s): AD-A317481; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), microfiche

The Metafile for Interactive Documents (MID) is a proposed standard for portable interactive electronic documents. Developed in response to a Department of the Navy R&D initiative, MID solves existing problems with interoperability of hypermedia applications such as Interactive Electron ic Technical Manuals (IETMs). MID fills the gap in current standards for IETMs, which focus on the structure of the source database and how the presentation should look. What is missing is an interchange language to standardize the path from source information to presentation, while preserving the logic governing user interactions. Using the international standards SGML (ISO 8879) and HyTime (ISO 10744), MID defines this missing interchange structure. Although initiated by IETM interoperability problems within the Navy, the MID was designed for general application to any interactive hypermedia document that requires conditional navigation. The MID Application Guide includes the annotated MID Document Type Definition (DTD) and explains how the design team intended the DTD to be implemented. Descriptions of each DTD element are provided. The Application Guide also includes an introduction to the MID concept and its goals, a processable MID DTD, and examples.
DTIC
Functional Design Specifications; Navigation

19970020402 National Academy of Sciences - National Research Council, Computer Science and Telecommunications Board, Washington, DC USA
The Unpredictable Certainty: Information Infrastructure through 2000
1996; 298p; In English
Contract(s)/Grant(s): NSF IRI-94-21465
Report No.(s): LC-96-67383; ISBN-0-309-05432-X; Copyright Waived; Avail: CASI; A13, Hardcopy; A03, microfiche

This paper discusses the underlying technologies, appliances, and services needed to enhance the NII and analyzes current levels of deployment in telephone, cable and wireless systems, and the difficulties in interconnections. The volume explores the

challenge of open interfaces that stimulate new applications but also facilitate competition, the trend toward the separation of infrastructure from specific services, the tension between mature services and new contenders, the growth of the Internet, and more. Derived from text

Communication Networks; Internets; Telecommunication; Technology Utilization; Technology Assessment

89
ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy, and astrometry.

19970019939 Columbia Univ., Columbia Astrophysics Lab., New York, NY USA

The Geminga Pulsar: Soft X-Ray Variability and an EUVE Observation

Halpern, Jules P., Columbia Univ., USA; Martin, Christopher, California Inst. of Tech., USA; Marshall, Herman L., Massachusetts Inst. of Tech., USA; The Astrophysical Journal; Dec. 10, 1996; Volume 473, pp. L37-L40; In English

Contract(s)/Grant(s): NAG5-2569; NAG5-1935; NAGw-4482

Report No.(s): NASA-CR-204446; NAS 1.26:204446; CAL-611; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, microfiche

We observed the Geminga pulsar with the EUVE satellite, detecting pulsed emission in the Deep Survey imager. Joint spectral fits of the EUVE flux with ROSAT PSPC data are consistent with thermal plus power-law models in which the thermal component makes the dominant contribution to the soft X-ray flux seen by EUVE and ROSAT. The data are consistent with blackbody emission of T = (4-6) x 10(exp 5) K over most of the surface of the star at the measured parallax distance of 160 pc. Although model atmospheres are more realistic, and can fit the data with effective temperatures a factor of 2 lower, current data would not discriminate between these and blackbody models. We also find evidence for variability of Geminga's soft X-ray pulse shape. Narrow dips in the light curve that were present in 1991 had largely disappeared in 1993/1994, causing the pulsed fraction to decline from 32% to 18%. If the dips are attributed to cyclotron resonance scattering by an e(+/-) plasma on closed magnetic field lines, then the process that resupplies that plasma must be variable.

Author

Pulsars; Satellite Observation; Neutron Stars; X Ray Stars; Black Body Radiation; Light Curve

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also 75 Plasma Physics.

19970019312 Stanford Univ., Dept. of Physics, Stanford, CA USA

Ginga Studies of Black Hole Candidates: Multiwavelength Studies Using Temporal Lags and Coherence Function Analysis and Ginga Archival Studies of QPOs in LMXB Z-Sources ***Final Report, 25 Nov. 1992 - 23 Nov 1995***

Michelson, Peter F., Stanford Univ., USA; May 25, 1996; 38p; In English

Contract(s)/Grant(s): N00014-93-1-2001

Report No.(s): AD-A318482; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The purpose of the research was to carry out analysis of x-ray temporal observations of several bright galactic x-ray binary systems containing neutron stars that are suspected to have weak magnetic fields and rapid spin periods and to study the X-ray timing signals from binaries suspected to contain black holes. Cygnus X-1 is such a source. The observations and analysis were done in a collaborative mode with the Naval Research Laboratory, Washington, D.C. and the Institute of Space and Astronautical Science (ISAS) of Japan. The observations were performed with the orbiting Japanese x-ray observatory Ginga. Analysis was done on computers at Stanford University, NRL and ISAS.

DTIC

Neutron Stars; X Ray Binaries; Stellar Magnetic Fields; Black Holes (Astronomy); Spaceborne Astronomy

19970019368 Science Applications International Corp., Monterey, CA USA

Laboratory and Space Plasma Studies ***Final Report***

Hyman, Ellis, Science Applications International Corp., USA; Aug. 01, 1996; 809p; In English

Contract(s)/Grant(s): N00014-93-C-2178

Report No.(s): AD-A318868; No Copyright; Avail: CASI; A99, Hardcopy; A10, microfiche

The work performed by Science Applications International Corporation (SAIC), encompasses a wide range of topics in experimental, computational, and analytical laboratory and space plasma physics. The accomplishments described in this report have been in support of the programs of the Laser Plasma Branch (Code 6730) and other segments of the Plasma Physics Division at the Naval Research Laboratory (NRL) and cover the period 27 September 1993 to August 1, 1996. SAIC's efforts have been supported by subcontracts or consulting agreements with Pulse Sciences, Inc., Clark Richardson, and Biskup Consulting Engineers, Pharos Technical Enterprises, Plex Corporation, Cornell University, Stevens Institute of Technology, the University of Connecticut, Plasma Materials and Technologies, Inc., and GaSonics International, Inc. In the following discussions section we will describe each of the topics investigated and the results obtained. Much of the research work has resulted in journal publications and NRL Memorandum Reports in which the investigation is described in detail. These reports are included as Appendices to this Final Report.

DTIC

Plasmas (Physics); Data Acquisition; Numerical Analysis; Mathematical Models; Space Plasmas

19970019511 Oxford Univ., Oxford, UK

Non-Linear Evolution of the Tidal Angular Momentum of Protostructures 2: Non-Gaussian Initial Conditions

Catelan, Paolo, Oxford Univ., UK; Theuns, Tom, Oxford Univ., UK; Apr. 15, 1997; 22p; In English

Contract(s)/Grant(s): EEC-CT-93-0328; EEC-CT-94-1463

Report No.(s): OUAST/97/5; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The formalism that describes the non-linear growth of the angular momentum L of protostructures from tidal torques in a Friedmann Universe, as developed in a previous paper, is extended to include non-Gaussian initial conditions. We restrict our analysis here to a particular class of non-Gaussian primordial distributions, namely multiplicative models. In such models, strongly correlated phases are produced by obtaining the gravitational potential via a nonlinear local transformation of an underlying Gaussian random field. The dynamical evolution of the system is followed by describing the trajectories of fluid particles using second-order Lagrangian perturbation theory. In the Einstein-de Sitter universe, the lowest-order perturbative correction to the variance of the linear angular momentum of collapsing structures grows as t(exp 8/3) for generic non-Gaussian statistics, which contrasts with the t(exp 10/3) growth rate characteristic of Gaussian statistics. This is a consequence of the fact that the lowest-order perturbative spin contribution in the non-Gaussian case arises from the third moment of the gravitational potential, which is identically zero for a Gaussian field. Evaluating these corrections at the maximum expansion time of the collapsing structure, we find that these non-Gaussian and non-linear terms can be as high as the linear estimate, without the degree of non-Gaussianity as quantified by skewness and kurtosis of the density field being unacceptably large. The results suggest that higher-order terms in the perturbative expansion may contribute significantly to galactic spin which contrasts with the straightforward Gaussian case.

Author

Angular Momentum; Cosmology; Universe; Gravitational Collapse; Galactic Evolution

19970019922 Colorado Univ., JILA, Boulder, CO USA

Spectroscopy Made Easy: A New Tool for Fitting Observations with Synthetic Spectra

Valenti, J. A., Colorado Univ., USA; Piskunov, N., Uppsala Univ., Sweden; Astronomy & Astrophysics Supplement Series; Sep. 1996; Volume 118, pp. 595-603; In English

Contract(s)/Grant(s): NAG5-23007

Report No.(s): NASA-CR-204614; NAS 1.26:204614; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

We describe a new software package that may be used to determine stellar and atomic parameters by matching observed spectra with synthetic spectra generated from parameterized atmospheres. A nonlinear least squares algorithm is used to solve for any subset of allowed parameters, which include atomic data (log gf and van der Waals damping constants), model atmosphere specifications (T(sub eff, log g), elemental abundances, and radial, turbulent, and rotational velocities. LTE synthesis software handles discontiguous spectral intervals and complex atomic blends. As a demonstration, we fit 26 Fe I lines in the NSO Solar Atlas (Kurucz et al.), determining various solar and atomic parameters.

Author

Spectroscopy; Radiative Transfer; Applications Programs (Computers); Atmospheric Models; Nonlinearity; Algorithms

19970020397 Boston Coll., Inst. for Scientific Research, Chestnut Hill, MA USA

Space Environment Studies from CRRES, APEX, and DMSP Satellite Data ***Final Report, 30 Dec. 1991 - 31 Mar. 1996***

Delorey, Dennis E., Boston Coll., USA; Madden, Daniel, Boston Coll., USA; Holeman, Ernest, Boston Coll., USA; Parsons, Carolyn M., Boston Coll., USA; Pruneau, Paul N., Boston Coll., USA; Palys, John, Phillips Lab., USA; Martin, Kevin R., Boston Coll.,

USA; Jan. 31, 1996; 30p; In English
Contract(s)/Grant(s): F19628-92-K-0003; AF Proj. 7601
Report No.(s): PL-TR-96-2072; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The Institute for Scientific Research (ISR) of Boston College was contracted by the Space Physics Division (GPS) of the Phillips Laboratory (PL) Geophysics Directorate to perform research in the area of Space Particle Modeling and Effects. A number of computer models and simulations were developed by use of the data from various spacecraft including the Combined Release and Radiation Effects Satellite (CRRES), Defense Meteorological Satellite Program (DMSP), and Advanced Photovoltaic and Electronics Experiment (APEX).
Author
Space Environment Simulation; Radiation Belts; Aerospace Environments; Models; Single Event Upsets

19970020427 Oxford Univ., Dept. ofAstrophysics, Oxford, UK
T Pyxidis: The First Cataclysmic Variable with a Collimated Jet
Shahbaz, T., Oxford Univ., UK; Livio, M., Space Telescope Science Inst., USA; Southwell, K. A., Oxford Univ., UK; Charles, P. A., Oxford Univ., UK; 1997; 16p; In English
Contract(s)/Grant(s): NAGw-2678; GO-4377
Report No.(s): NASA-CR-204834; NAS 1.26:204834; OUAST/97/7; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

We present the first observational evidence for a collimated jet in a cataclysmic variable system; the recurrent nova T Pyxidis. Optical spectra show bipolar components of H(alpha) with velocities approx. 1400 km/s, very similar to those observed in the supersoft X-ray sources and in SS 433. We argue that a key ingredient of the formation of jets in the supersoft X-ray sources and T Pyx (in addition to an accretion disk threaded by a vertical magnetic field), is the presence of nuclear burning on the surface of the white dwarf.
Author
Collimation; Cataclysmic Variables; Line Spectra; Novae; Observation; Jet Flow

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LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

19970019307 NASA Ames Research Center, Moffett Field, CA USA
Ices on the Satellites of Jupiter, Saturn, and Uranus
Cruikshank, Dale P., NASA Ames Research Center, USA; Brown, Robert H., Jet Propulsion Lab., California Inst. of Tech., USA; Calvin, Wendy M., Geological Survey, USA; Roush, Ted L., NASA Ames Research Center, USA; 1995; 38p; In English
Contract(s)/Grant(s): RTOP 196-41-67-03; RTOP 151-01-60-01
Report No.(s): NASA-TM-112308; NAS 1.15:112308; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Three satellites of Jupiter, seven satellites of Saturn, and five satellites of Uranus show spectroscopic evidence of H2O ice on their surfaces, although other details of their surfaces are highly diverse. The icy surfaces contain contaminants of unknown composition in varying degrees of concentration, resulting in coloration and large differences in albedo. In addition to H2O, Europa has frozen SO2, and Ganymede has O2 in the surface; in both of these cases external causes are implicated in the deposition or formation of these trace components. Variations in ice exposure across the surfaces of the satellites are measured from the spectroscopic signatures. While H2O ice occurs on the surfaces of many satellites, the range of bulk densities of these bodies shows that its contribution to their overall compositions is highly variable from one object to another.
Author
Jupiter Satellites; Uranus Satellites; Ice; Saturn Satellites

19970019549 NASA Ames Research Center, Moffett Field, CA USA
The Surfaces of Pluto and Charon
Cruikshank, Dale P., NASA Ames Research Center, USA; Roush, Ted L., NASA Ames Research Center, USA; Moore, Jeffrey M., NASA Ames Research Center, USA; Sykes, Mark V., Arizona Univ., USA; Owen, Tobias C., Hawaii Univ., USA; Bartholomew, Mary Jane, NASA Ames Research Center, USA; Brown, Robert H., Jet Propulsion Lab., California Inst. of Tech., USA; Tryka, Kimberly A., University of Northern Arizona, USA; Jul. 29, 1996; 48p; In English

Report No.(s): NASA-TM-112310; NAS 1.15:112310; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Much of the surface of Pluto consists of high-albedo regions covered to an unknown depth by Beta-N2, contaminated with CH4, CO, and other molecules. A portion of the exposed surface appears to consist of solid H2O. The remainder is covered by lower albedo material of unknown composition. The N2 ice may occur as polar caps of large extent, leaving ices and other solids of lower volatility in the equatorial regions. The low-albedo material found primarily in the equatorial regions may consist in part of solid hydrocarbons and nitriles produced from N2 and CH4 in the atmosphere or in the surface ices. Alternatively, it may arise from deposition from impacting bodies and/or the chemistry of the impact process itself. Charon's surface is probably more compositionally uniform than that of Pluto, and is covered by H2O ice with possible contaminants or exposures of other materials that are as yet unidentified. The molecular ices discovered on Pluto and Charon have been identified from near-infrared spectra obtained with Earth-based telescopes. The quantitative interpretation of those data has been achieved through the computation of synthetic spectra using the Hapke scattering theory and the optical constants of various ices observed in the laboratory. Despite limitations imposed by the availability of laboratory data on ices in various mixtures, certain specific results have been obtained. It appears that CH4 and CO are trace constituents, and that some fraction of the CH4 (and probably the CO) on Pluto is dissolved in the matrix of solid N2. Pure CH4 probably also occurs on Pluto's surface, allowing direct access to the atmosphere. Study of the nitrogen absorption band at 2.148 micrometers shows that the temperature of the N2 in the present epoch is 40 +/-2 K. The global temperature regime of Pluto can be modeled from observations of the thermal flux at far-infrared and millimeter wavelengths. The low-albedo equatorial regions must be significantly warmer than the polar regions covered by N2 (at T = 40 K) to account for the total thermal flux measured. At the present season, the diurnal skin depth of the insolation-driven thermal wave is small, and the observed mm-wave fluxes may arise from a greater depth. Alternatively, the mm-wave flux may arise from the cool, sublimation source region. The surface microstructure in the regions covered by N2 ice is likely governed by the sintering properties of this highly volatile material. The observed nitrogen infrared band strength requires that expanses of the surface be covered with cm-sized crystals of N2. Grains of H2O ice on Charon, in contrast, are probably of order 50 micrometers in size, and do not metamorphose into larger grains at a significant rate. Because of the similarities in size, density, atmosphere and surface composition between Pluto and Neptune's satellite Triton, the surface structures observed by Voyager on Triton serve as a plausible paradigm for what might be expected on Pluto. Such crater forms, tectonic structures, aeolian features, cryovolcanic structures, and sublimation-degraded topography as are eventually observed on Pluto and Charon by spacecraft will give information on their interior compositions and structures, as well as on the temperature and wind regimes over the planet's extreme seasonal cycle.
Author

Pluto (Planet); Surface Layers; Contamination; Charon; Nitrogen; Hydrocarbons; Topography; Polar Regions; Solid Nitrogen

19970019900 Hawaii Univ., Planetary Geosciences, Honolulu, HI USA

A Spectral Survey of the Crisium Basin Region of the Moon

Blewett, D. T., Hawaii Univ., USA; Hawke, B. R., Hawaii Univ., USA; Lucey, P. G., Hawaii Univ., USA; Spudis, P. D., Lunar and Planetary Inst., USA; Geophysical Research Letters; Nov. 15, 1995; ISSN 0094-8534; Volume 22, No. 22, pp. 3059-3062; In English

Contract(s)/Grant(s): NAGw-237

Report No.(s): NASA-CR-204593; NAS 1.26:204593; Paper-95GL03079; HIGP-Contrib-821; SOEST-Contrib-3919; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, microfiche

The Crisium basin region harbors a number of interesting features, including geochemical and radar anomalies, light plains units and possible hidden mare deposits (cryptomaria). This report presents preliminary results of a telescopic near-infrared spectral study concerning a variety of surface units in the Crisium region. Observations were made of Mare Crisium, light plains deposits north of Taruntius crater, and the terra associated with the Crisium basin.
Author

Geochemistry; Structural Basins; Lunar Craters; Anomalies; Moon; Spectra

19970019937 NASA Johnson Space Center, Houston, TX USA

Constraints on Martian Differentiation Processes from Rb-SR and Sm-Nd Isotopic Analyses of the Basaltic Shergottite QUE 94201

Borg, Lars E., NASA Johnson Space Center, USA; Nyquist, Larry E., NASA Johnson Space Center, USA; Taylor, Larry A., Tennessee Univ., USA; Wiesmann, Henry, Lockheed Martin Corp., USA; Shih, Chi-Y., Lockheed Martin Corp., USA; 1997; 48p; In English

Contract(s)/Grant(s): RTOP 152-14-00

Report No.(s): NASA-TM-112829; NAS 1.15:112829; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Isotopic analyses of mineral, leachate, and whole rock fractions from the Martian shergottite meteorite QUE 94201 yield Rb-SR and Sm-Nd crystallization ages of 327 +/- 12 and 327 +/- 19 Ma, respectively. These ages are concordant, although the isochrons are defined by different fractions within the meteorite. Comparison of isotope dilution Sm and Nd data for the various QUE 94201 fractions with in situ ion microprobe data for QUE 94201 minerals from the literature demonstrate the presence of a leachable crustal component in the meteorite. This component is likely to have been added to QUE 94201 by secondary alteration processes on Mars, and can affect the isochrons by selectively altering the isotopic systematics of the leachates and some of the mineral fractions. The absence of crustal recycling processes on Mars may preserve the geochemical evidence for early differentiation and the decoupling of the Rb-SR and Sm-Nd isotopic systems, underscoring one of the fundamental differences between geologic processes on Mars and the Earth.

Author (revised)

Mars (Planet); Mars Surface; Planetary Geology; Isotopes; Ion Probes; Rubidium 86; Samarium Isotopes; Rubidium Isotopes; Neodymium Isotopes

19970020027 NASA Ames Research Center, Moffett Field, CA USA

The Surface Compositions of Triton, Pluto, and Charon

Cruikshank, Dale P., NASA Ames Research Center, USA; Roush, Ted L., San Francisco State Univ., USA; Owen, Tobias C., Hawaii Univ., USA; Quirico, Eric, Domaine Univ., France; DeBergh, Catherine, Observatoire de Paris-Meudon, France; Jun. 24, 1995; 32p; In English

Contract(s)/Grant(s): RTOP 196-41-67-03; RTOP 151-01-60-01

Report No.(s): NASA-TM-112309; NAS 1.15:112309; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Neptune's satellite Triton, and the planet-satellite binary Pluto and Charon, are the most distant planetary bodies on which ices have been directly detected. Triton and Pluto have very similar dimensions and mean densities, suggesting a similar or common origin. Through earth-based spectroscopic observations in the near-infrared, solid N2, CH4, and CO have been found on both bodies, with the additional molecule C02 on Triton. N2 dominates both surfaces, although the coverage is not spatially uniform. On Triton, the CH4 and CO are mostly or entirely frozen in the N2 matrix, while CO2 may be spatially segregated. On Pluto, some CH4 and the CO are frozen in the N2 matrix, but there is evidence for additional CH4 in a pure state, perhaps lying as a lag deposit on a subsurface layer of N2. Despite their compositional and dimensional similarities, Pluto and Triton are quite different from one another in detail. Additional hydrocarbons and other volatile ices have been sought spectroscopically but not yet have been detected. The only molecule identified on Pluto's satellite Charon is solid H2O, but the spectroscopic data are of low precision and admit the presence of other ices such as CH4.

Author

Neptune (Planet); Binary Data; Charon; Pluto (Planet); Surface Properties; Natural Satellites; Planetary Surfaces; Planetary Composition

19970020398 National Academy of Sciences - National Research Council, Committee on Planetary and Lunar Exploration, Washington, DC USA

Scientific Assessment of NASA's Solar System Exploration Roadmap

Aug. 23, 1996; 18p; In English

Contract(s)/Grant(s): NASw-96013

Report No.(s): NASA-CR-201492; NAS 1.26:201492; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

At its June 24-28, 1996, meeting, the Space Studies Board's Committee on Planetary and Lunar Exploration (COMPLEX), chaired by Ronald Greeley of Arizona State University, conducted an assessment of NASA's Mission to the Solar System Roadmap report. This assessment was made at the specific request of Dr. Jurgen Rahe, NASA's science program director for solar system exploration. The assessment includes consideration of the process by which the Roadmap was developed, comparison of the goals and objectives of the Roadmap with published National Research Council (NRC) recommendations, and suggestions for improving the Roadmap.

Derived from text

Conferences; Lunar Exploration; Solar System

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 Space Radiation.

19970019490 Applied Research Corp., Landover, MD USA
Correlative Analysis of Hard and Soft X-ray Emissions in Solar Flares ***Final Report, 2 Nov. 1995 - 1 May 1997***
Zarro, Dominic M., Applied Research Corp., USA; May 20, 1997; 10p; In English
Contract(s)/Grant(s): NASA Order S-57783-F
Report No.(s): NASA-CR-204530; NAS 1.26:204530; R97-257; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

This report describes research performed under the Phase 3 Compton Gamma-Ray Observatory (CGRO) Guest Investigator Program. The objective of this work is to study different mechanisms of solar flare heating by comparing their predictions with simultaneous hard and soft X-ray observations. The datasets used in this work consist of hard X-ray observations from the CGRO Burst and Transient Source Experiment (BATSE) and soft X-ray observations from the Bragg Crystal Spectrometer (BCS) and Soft X-ray telescope (SXT) on the Japanese Yohkoh spacecraft.
Author
Solar Flares; Emission Spectra; X Rays; X Ray Telescopes; Gamma Ray Bursts

19970019636 Montana State Univ., Bozeman, MT USA
The Solar-B Mission ***Final Report, 20 Feb. - 19 May 1997***
Antiochos, Spiro, Naval Research Lab., USA; Acton, Loren, Montana State Univ., USA; Canfield, Richard, Montana State Univ., USA; Davila, Joseph, NASA Goddard Space Flight Center, USA; Davis, John, NASA Marshall Space Flight Center, USA; Dere, Kenneth, Naval Research Lab., USA; Doschek, George, Naval Research Lab., USA; Golub, Leon, Harvard-Smithsonian Center for Astrophysics, USA; Harvey, John, National Solar Observatory, USA; Hathaway, David, NASA Marshall Space Flight Center, USA; Hudson, Hugh, Solar Physics Research Corp., USA; Moore, Ronald, NASA Marshall Space Flight Center, USA; Lites, Bruce, National Center for Atmospheric Research, USA; Rust, David, Johns Hopkins Univ., USA; Strong, Keith, Lockheed Martin Corp., USA; Title, Alan, Lockheed Martin Corp., USA; Jun. 09, 1997; 70p; In English
Contract(s)/Grant(s): NASA Order H-27836-D
Report No.(s): NASA-CR-204628; NAS 1.26:204628; No Copyright; Avail: CASI; A04, Hardcopy; A01, microfiche

Solar-B, the next ISAS mission (with major NASA participation), is designed to address the fundamental question of how magnetic fields interact with plasma to produce solar variability. The mission has a number of unique capabilities that will enable it to answer the outstanding questions of solar magnetism. First, by escaping atmospheric seeing, it will deliver continuous observations of the solar surface with unprecedented spatial resolution. Second, Solar-B will deliver the first accurate measurements of all three components of the photospheric magnetic field. Solar-B will measure both the magnetic energy driving the photosphere and simultaneously its effects in the corona. Solar-B offers unique programmatic opportunities to NASA. It will continue an effective collaboration with our most reliable international partner. It will deliver images and data that will have strong public outreach potential. Finally, the science of Solar-B is clearly related to the themes of origins and plasma astrophysics, and contributes directly to the national space weather and global change programs.
Author
Solar Magnetic Field; Solar Activity; Plasmas (Physics); Magnetic Properties; Magnetic Fields; Coronas; Photosphere

19970019685 NASA Marshall Space Flight Center, Huntsville, AL USA
Disruption of Helmet Streamers by Current Emergence
Guo, W. P., Alabama Univ., USA; Wu, S. T., Alabama Univ., USA; Tandberg-Hanssen, E., NASA Marshall Space Flight Center, USA; The Astrophysical Journal; Oct. 01, 1996; Volume 469, pp. 33368-1 - 33368-10; In English
Contract(s)/Grant(s): NAGw-4665
Report No.(s): NASA-CR-204418; NAS 1.26:204418; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, microfiche

We have investigated the dynamic response of a coronal helmet streamer to the emergence from below of a current with its magnetic field in a direction opposite to the overlying streamer field. Once the emerging current moves into the closed region of the streamer, a current sheet forms between the emerging field and the streamer field, because the preexisting field and the newly emerging field have opposite polarities. Thus magnetic reconnection will occur at the flanks of the emerged structure where the current density is maximum. If the emerging current is large enough, the energy contained in the current and the reconnection will promptly disrupt the streamer. If the emerging current is small, the streamer will experience a stage of slow evolution. In this stage, slow magnetic reconnection occurring at the flanks of the emerged structure leads to the degeneration of the emerged current to

a neutral point. Above this point, a new magnetic bubble will form. The resulting configuration resembles an inverse-polarity prominence. Depending on the initial input energy of the current, the resulting structure will either remain in situ, forming a quasi-static structure, or move upward, forming a coronal transient similar to coronal jets. The numerical method used in this paper can be used to construct helmet streamers containing a detached magnetic structure in their closed field region. The quasi-static solution may serve as a preevent corona for studying coronal mass ejection initiation.
Author
Magnetic Field Reconnection; Mathematical Models; Space Plasmas; Magnetohydrodynamics; Current Sheets; Solar Corona

19970019702 Colorado Univ., Joint Inst. for Laboratory Astrophysics, Boulder, CO USA
The Corona of the Young Solar Analog EK Draconis
Gudel, M., Paul Scherrer Inst., Switzerland; Schmitt, J. H. M. M., Max-Planck-Inst. fuer Extraterrestrische Physik, Germany; Benz, A. O., Eidgenoessische Technische Hochschule, Switzerland; Elias, N. M., II, Naval Observatory, USA; Astronomy and Astrophysics; 1995; Volume 301, pp. 201-212; In English
Contract(s)/Grant(s): NAG5-2075; SNSF-8220-033360; SNSF-20-040336.94
Report No.(s): NASA-CR-204568; NAS 1.26:204568; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

First coronal microwave and new soft X-ray observations of the very active, near-Zero-Age Main-Sequence (ZAMS) dGOe star EK Dra = HD 129333 show that this analog of the young Sun is more luminous in both emissions than most single M-dwarf flare stars. Variations in the 8.4 GHz flux include modulation with the optically determined rotation period of 2.7 days. This result points to a non-uniform filling of the corona with energetic electrons due to an incomplete coverage of the surface with active regions and a source volume that is not concentric with the star. The radio luminosity varying between log L(sub R) = 13.6 and 14.6 (L(sub R) in erg/s/Hz) shows evidence for unpolarized gyrosynchrotron flares, while strongly polarized flares were absent during the observations. This star is the first young, truly solar-like main sequence G star discovered in microwaves. Having just arrived on the main sequence, it conclusively proves that young, solar-like G stars can maintain very high levels of radio emission after their T Tau phase. The X-ray observations were obtained from the ROSAT All-Sky Survey (RASS). The average X-ray luminosity amounts to log L(sub x) = 29.9 (L(sub x) in erg/s). A Raymond-Smith type plasma model fit yields two plasma components at temperatures of 1.9 and 10 MK, with volume emission measures of 1.2 and 2.5 x 10 (exp 52)/cu cm, respectively. The X-ray light curve is significantly variable, with the photon count rate from the cooler plasma being strongly modulated by the rotation period; the emission from the hotter plasma is only weakly variable. Modeling of the source distribution in the stellar corona yields electron densities of the order of 4 x 10(exp 10)/cu cm or higher for the cool plasma component. It indicates that a considerable portion of EK Dra's high X-ray luminosity is due to high-density plasma rather than large emission volume. Parameters for an X-ray flare indicate an electron density of 1.75 x 10(exp 11)/cu cm and a source height of (1-2) x 10(exp 10) cm, compatible with a few times the scale height of the cooler plasma component.
Author
Dwarf Stars; Stellar Coronas; Microwaves; Radio Emission; X Rays; Luminosity; Electron Density (Concentration)

19970019892 Phillips Lab., Hanscom AFB, MA USA
Study of the Relationship Between Coronal Mass Ejections and Energetic Electrons in Interplanetary Space
Daibog, E. I., Moscow State Univ., Russia; Kahler, S. W., Phillips Lab., USA; Stolpovskii, V. G., Moscow State Univ., Russia; Dec. 13, 1996; 9p; In English
Contract(s)/Grant(s): AF Proj. 2311
Report No.(s): AD-A319277; PL-TR-96-2303; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

We consider time characteristics of energetic electron events in interplanetary space after solar flares associated with coronal mass ejections (CME)-Analysis of electron intensity-time profiles shows that independently of flare duration times to electron event maximum from flare onset and from electron event onset increase with increasing of CME velocity. Possible interpretation of this effect is electron acceleration by CME associated shock wave.
DTIC
Interplanetary Space; Stellar Mass Ejection; Solar Flares; Shock Waves

19970019907 Applied Research Corp., Greenbelt, MD USA
Energetic Consequences of the DC-Electric Field Model
Zarro, Dominic M., Applied Research Corp., USA; Schwartz, Richard A., Hughes STX, Inc., USA; Magnetic Reconnection in the Solar Atmosphere: ASP Conference Series; 1996; Volume 3, pp. 209-214; In English
Report No.(s): NASA-CR-204581; NAS 1.26:204581; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

We analyze a solar flare observed simultaneously in soft and hard X-rays by instruments onboard Yohkoh and the Compton Gamma Ray Observatory. Assuming a simple one-dimensional coronal loop that is heated by field-aligned currents, we solve the energy balance equation to derive the DC-electric field strength necessary to explain the observed soft X-ray emission by current-dissipation. We use the derived DC-electric field to predict the number flux of electrons accelerated by thermal runaway and compare this prediction with the number flux of nonthermal thick-target electrons implied by impulsive phase hard X-ray observations. We find that runaway acceleration can account for the large flux (approx. greater than 10(exp 36 1/s) of nonthermal electrons provided the loop filling factor is approx. less than 10(exp -3) such that heating and acceleration occur in filamented structures within the loop.
Author
Solar Flares; X Rays; Coronal Loops; Direct Current; Electric Field Strength; Thermal Emission; Nonthermal Radiation

19970020044 Colorado Univ., Joint Inst. for Laboratory Astrophysics, Boulder, CO USA
Chromospheres of Coronal Stars
Linsky, Jeffrey L., Colorado Univ., USA; Wood, Brian E., Colorado Univ., USA; Magnetodynamic Phenomena in the Solar Atmosphere: Prototypes of Stellar Magnetic Activity; 1996, pp. 55-62; In English
Contract(s)/Grant(s): NASA Order S-56460-D
Report No.(s): NASA-CR-204569; NAS 1.26:204569; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, microfiche

We summarize the main results obtained from the analysis of ultraviolet emission line profiles of coronal late-type stars observed with the Goddard High Resolution Spectrograph (GHRS) on the Hubble Space Telescope. The excellent GHRS spectra provide new information on magnetohydrodynamic phenomena in the chromospheres and transition regions of these stars. One exciting new result is the discovery of broad components in the transition region lines of active stars that we believe provide evidence for microflare heating in these stars.
Author
Chromosphere; Coronas; Late Stars; Ultraviolet Emission

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SPACE RADIATION

Includes cosmic radiation; and inner and outer earth's radiation belts. For biological effects of radiation see 52 Aerospace Medicine. For theory see 73 Nuclear and High-Energy Physics.

19970019308 Pennsylvania State Univ., University Park, PA USA
High Energy Antimatter Telescope (HEAT) Balloon Experiment ***Final Report***
Beatty, J. J., Pennsylvania State Univ., USA; Jul. 17, 1995; 5p; In English
Contract(s)/Grant(s): NAGw-4737
Report No.(s): NASA-CR-204405; NAS 1.26:204405; No Copyright; Avail: CASI; A01, Hardcopy; A01, microfiche

This grant supported our work on the High Energy Antimatter Telescope(HEAT) balloon experiment. The HEAT payload is designed to perform a series of experiments focusing on the cosmic ray positron, electron, and antiprotons. Thus far two flights of the HEAT -e+/- configuration have taken place. During the period of this grant major accomplishments included the following: (1) Publication of the first results of the 1994 HEAT-e+/- flight in Physical Review Letters; (2) Successful reflight of the HEAT-e+/- payload from Lynn Lake in August 1995; (3) Repair and refurbishment of the elements of the HEAT payload damaged during the landing following the 1995 flight; and (4) Upgrade of the ground support equipment for future flights of the HEAT payload.
Derived from text
Positrons; Spaceborne Telescopes; Cosmic Rays; Antiprotons; Spaceborne Experiments; Balloon Flight; Radiation Detectors

19970020279 Tokyo Univ., Research Center for the Early Universe, Japan
Detection of Magnetospheric X-Ray Pulsation from the Millisecond Pulsar B1821-24
Saito, Y., Tokyo Univ., Japan; Kawai, N., Institute of Physical and Chemical Research, Japan; Kamae, T., Tokyo Univ., Japan; Shibata, S., Yamagata Univ., Japan; Dotani, T., Tokyo Univ., Japan; Kulkarni, S. R., California Inst. of Tech., USA; 1997; 22p; In English; Sponsored in Part by the Scientific Research Fund of MESC.
Contract(s)/Grant(s): MESC-07247223
Report No.(s): RESCEU-6/97; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

We report the first clear detection of X-ray pulsation of magnetospheric origin from a millisecond pulsar PSR B1821-24 with Advanced Satellite for Cosmology and Astrophysics (ASCA). The photon arrival time shows the periodicity of 3.05 ms period as observed in radio band. The observed X-ray pulse is double peaked. The pulses are characterized by a sharp temporal profile and hard power-law spectrum with a phase averaged photon index of approx. 1.9. These two features are quite similar to the X-ray/gamma-ray pulse from the Crab pulsar and characteristic of the non-thermal emission from the magnetosphere of the neutron star, but contradictable to the thermal emission from its surface. Since this pulsar has completely different physical parameters from those of young pulsars, we expect these observations to provide significant constraints to models of pulsars magnetospheric emission which have been developed mostly based on the observations of young pulsars.
Author
Pulsars; X Rays; Pulsar Magnetospheres; Energy Spectra

19970020419 Panametrics, Inc., Waltham, MA USA
Analyze Data from the PASP Plus Dosimeter on the APEX Spacecraft ***Final Report, Jul. 1993 - Apr. 1996***
Hanser, Frederick A., Panametrics, Inc., USA; Morel, Paul R., Panametrics, Inc., USA; May 10, 1996; 38p; In English
Contract(s)/Grant(s): F19628-93-C-0151; AF Proj. 2822
Report No.(s): PL-TR-96-2088; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Data analysis procedures for the PASP Plus Dosimeter SN/2 in the APEX spacecraft are given, including dead time corrections for high count rate periods. The SN/1 unit calibration data from the MIT Van de Graaff have been reduced to geometric factors, including corrections for the calibration sources. The new calibrated geometric factor electron thresholds deviate slightly the theoretical thresholds and from the earlier calibrations of the CRRES Dosimeter. The PASP Plus Dosimeter electron calibration data are believed to be the more accurate, and are likely to apply to the CRRES D1 detector. The in-orbit data from the SN/2 dosimeter show that all detectors were initially operating properly, and the calibration source data show that the detectors are fully depleted. Typical flux data plots are shown for different orbit orientations. The PASP Plus dosimeter is returning good data from all four domes after 1 year, 9 months in orbit.
Author
Extraterrestrial Radiation; Dosimeters; Calibrating; Radiation Measurement; Satellite Instruments

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GENERAL

19970019351 NASA Marshall Space Flight Center, Huntsville, AL USA
FY 1996 Scientific and Technical Reports, Articles, Papers, and Presentations, Volume 1
Turner-Waits, Joyce E., Compiler, NASA Marshall Space Flight Center, USA; Oct. 1996; 68p; In English
Report No.(s): NASA-TM-108528-Vol-1; NAS 1.15:108528-Vol-1; No Copyright; Avail: CASI; A04, Hardcopy; A01, microfiche

This document presents formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY96. It also includes papers of MSFC contractors. After being announced in STAR, all of the NASA series reports may be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. The information in this report may be of value to the scientific and engineering community in determining what information has been published and what is available.
Author
Bibliographies; Indexes (Documentation); Reports; Information Systems

19970020121 Air Force Inst. of Tech., National Air Intelligence Center, Wright-Patterson AFB, OH USA
A Critique of Photoelectronic Countermeasures
Zhao, Guang-Fu, Beijing Space Vehicle General Design Dept., China; Review of Electro-Optical Countermeasures Technology; Sep. 30, 1996, pp. 13-19; In English; Translated into English by Leo Kanner Associates
Contract(s)/Grant(s): F33657-88-D-2188
Report No.(s): AD-A316768; NAIC-ID(RS)T-0501-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

In modern warfare, photoelectronic technology has been widely used by the military. With the rapid growth in photoelectronic technology, photoelectronic countermeasures technology has played an important role in such military applications as photoelec-

tronic reconnaissance and counter reconnaissance, ECM and counter ECM. This article will provide a critique of the developments in photoelectronic countermeasures.
DTIC
Electronic Countermeasures; Optical Countermeasures

19970020300 Air Force Inst. of Tech., National Air Intelligence Center, Wright-Patterson AFB, OH USA
Generation of Error Signals by Ring Tracker
Jinduo, Li, China Aerospace Corp., China; Chinese Astronautics and Missilery Abstracts; Oct. 04, 1996; Volume 3, No. 1, pp. 54-58; In English; Translated by Leo Kanner Associates
Contract(s)/Grant(s): F33657-88-D-2188
Report No.(s): AD-A316762; NAIC-ID(RS)T-0317-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

This paper introduces some technical approaches by which a ring tracker can generate error signals, namely: the analog digital circuit method and the computer data processing method. Also, it derivates an error-based information mathematical model and discusses how to redesign error properties with a computer software method.
DTIC
Countermeasures; Error Signals; Infrared Tracking